Montana Fish, Wildlife & Parks

Montana Fish, Wildlife & Parks
4600 Giant Springs Road
Great Falls, MT 594405

February 20, 2013

Dear Interested Party:

Montana Fish, Wildlife & Parks (MFWP) has developed a draft Environmental Assessment (EA) prepared for the proposed action of a grazing lease renewal on the Blackleaf Wildlife Management Area (BLWMA). The 9000 acre BLWMA is located approximately 12 air miles west of Bynum along the Rocky Mountain Front occupying land in Teton County. The proposed grazing lease would allow cattle to be utilized as a management tool to remove residual vegetation and improving vegetative condition thus enhancing the availability and palatability of elk and deer forage on the portion of the BLMWA to be grazed. The BLWMA has been successfully grazed with a rest-rotation grazing system since 1990.

The EA is available at: www.fwp.mt.gov - "Recent Public Notices". If you would like to request a printed version of the EA contact the Region 4 Office at (406) 454-5840. Questions and comments on the EA will be accepted through March 13, 2013.

Written comments can be mailed to the following address:

Blackleaf WMA Grazing EA Comments
Montana Fish, Wildlife & Parks
514 South Front Street, Suite C
Conrad, MT 59425

Or email comments to: rrauscher.fwp@gmail.com

Thank you for your interest on this project.

Sincerely,

Graham Taylor
Montana Fish, Wildlife & Parks
Region 4 Wildlife Manager
Great Falls, MT

Montana Fish, Wildlife & Parks
Draft Environmental Assessment

BLACKLEAF WILDLIFE MANAGEMENT AREA GRAZING LEASE

PART I. PROPOSED ACTION DESCRIPTION

1. Type of proposed state action:

Montana Fish, Wildlife and Parks (MFWP) propose to lease approximately ¼ of the 9000 acre Blackleaf Wildlife Management Area (BLWMA) annually for cattle grazing to better manage vegetation for wildlife cover and forage.

2. Agency authority for the proposed action:
FWP has the authority under Section 87-1-210 MCA to protect, enhance, and regulate the use of Montana's fish and wildlife resources for public benefit now and in the future. In addition, in accordance with the Montana Environmental Policy Act, Montana Fish, Wildlife & Parks (MFWP) is required to assess the impacts that any proposal or project might have on the natural and human environments. Further, MFWP's land lease-out policy, as it pertains to the disposition of interest in Department lands (89-1-209) requires an Environmental Assessment (EA) to be written for all new grazing leases, lease extensions or lease renewals.

3. Anticipated Schedule:

Public Comment Period: February 20 – March 13, 2013
Decision Notice: March 15, 2013
FWP Commission Final Consideration: April, 2013
Lease Begins: June 1, 2013
Lease Ends: August 31, 2019
Term of Lease: 7 years
Grazing Schedule: June 1 to August 31 annually

4. Location affected by proposed action:

The Blackleaf Wildlife Management Area (BLWMA, Figure 1.) is located approximately 12 air miles west of Bynum (Appendix A). The proposed grazing lease includes a portion of the BLWMA as part of an overall rest rotation grazing system that has been in operation since 1990. See Appendix C for a complete grazing plan.

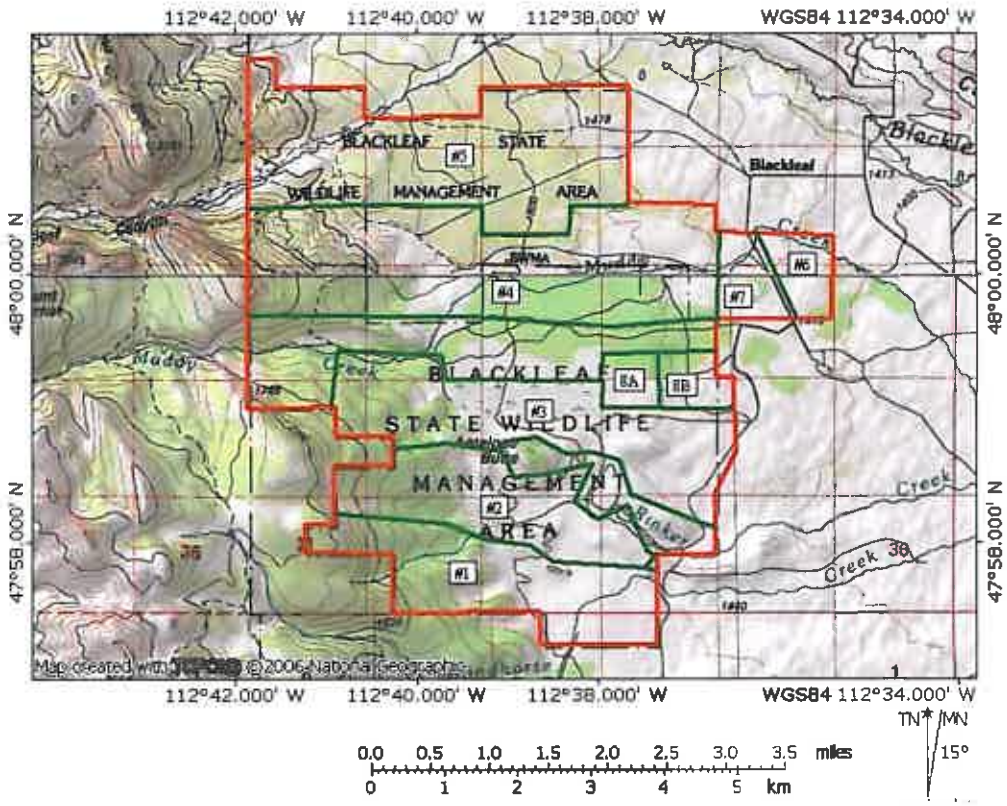


Figure 1. Map of pastures to be grazed on the Blackleaf WMA on a rotational basis.

Project size:

	Acres		Acres
(a) Developed:		(d) Floodplain	0
Residential	0		
Industrial	0	(e) Productive:	
(existing shop area)		Irrigated cropland	0
(b) Open Space/	0	Dry cropland	0
Woodlands/Recreation		Forestry	800
(c) Wetlands/Riparian	200	Rangeland	8000
Areas		Other	0

6. Permits, Funding & Overlapping Jurisdictions:

(a) Permits: None required

(b) Funding: NA

(c) Other Overlapping or Additional Jurisdictional Responsibilities: None

7. Narrative summary of the proposed action:

The BLWMA encompasses over 9,000 acres, all managed by MFWP. The area to be grazed is of gentle and rolling topography and is primarily limber pine and grassland savannah – with scattered Douglas fir. A more complete description of vegetation and vegetation condition on the Blackleaf WMA can be found in *Blackleaf Wildlife Management Area Vegetation Condition and Trend 1979-2009* by Gary Olson (Appendix D).

One of the primary goals for the BLWMA is to emphasize the occurrence of highly productive, diverse plant communities that will provide the best possible quality forage and cover for native wildlife species. Prairie vegetation is managed with emphasis on rough fescue (*Festuca scabrella*) because of its palatability to big game species. Rough fescue is considered a climax species in mountain-foothill zones of Montana (USDA, 1976) and preferred winter forage by elk. It is therefore considered an indicator of overall grassland health. Numerous studies have shown that, if this plant is carefully managed, the entire plant community moves toward a more productive, vigorous climax. The rough fescue/Idaho fescue habitat type is one of the most productive in western Montana

In June of 1990, a rotational grazing system was initiated utilizing livestock from neighboring ranches. The grazing system is designed to duplicate, as nearly as possible, natural ungulate grazing. Each 600-1000 acre unit is grazed for 6-7 weeks, beginning approximately June 1, and then allowed complete rest for 3 full growing seasons. Pasture units 1-4 provide the majority of livestock grazing on the WMA (see Appendix C). Units 5-8 are grazed as part of the overall grazing rotation system. Dependent upon vegetative and climatic conditions, grazing units 1-4 may be divided into halves or thirds, using portable solar-powered electric fencing, and grazed for 2-3 weeks each. Electric fences are removed at the end of each grazing season, generally in early August.

Analysis of vegetation data from 1979-2009 indicates a significant increase in overall grass cover and a significant decline in forb/shrub cover on the BLWMA. Range condition has improved to "good-excellent" status (by NRCS standards applied in 1979) based upon significant improvement in rough fescue cover and declining influence of several forb species. Total vegetative cover (of all species) varies (35-48%) by sampling period and shows no significant upward or downward trend. Rough fescue, a very important deer and elk winter/spring forage species, has increased significantly in basal cover. Horizontal juniper, an important browse for mule deer in mountain-foothill prairie habitats, also exhibited a significant increase over the 30 year period.

Elk, mule and white-tailed deer and pronghorn antelope currently use the BLWMA throughout the year. The BLWMA is an important elk winter range on the Rocky Mountain Front. Proposed livestock grazing will continue to enhance the increased production of rough fescue according to the 4-year rotational schedule. The goal to manage for the occurrence of highly productive, diverse plant communities providing the quality forage and cover is being met through livestock grazing. As a result, the improved forage quality is encouraging the use of the BLMWA by elk, mule deer and antelope during the spring and providing quality winter forage. Periodic livestock grazing of the area will continue enhance winter range habitat and forage for elk and mule deer, which is the primary objective of the current management plan for the Blackleaf (1993).

Elk and other game species can be found on the adjacent lessee's property. Historically, the lessee has allowed public hunting with permission to over 7000 acres of their property as a condition of grazing the BLWMA. The cooperative nature of reciprocal hunting access has allowed improved management of elk in the area and increased hunter opportunity. As a part of the proposed action, the lessee proposes to allow public hunting with permission on their property for the duration of the lease agreement. Public access to portions of the ranch at certain times of the year may be denied due to the presence of livestock or other activities that might inhibit normal ranching operations. The lessee will regulate hunter numbers and timing and distribution of hunters on a first-come, first-served basis. Hunting will be allowed by permission only. A map of the adjacent property is included in Appendix B.

The grazing capacity of the BLWMA is estimated to be a maximum of 1500 Animal Unit Months (AUMs) annually. During the 4 year rotation, each pasture would be grazed from approximately June 1 – August 31 although actual dates may vary depending upon environmental conditions and number of cattle to be grazed. Following grazing, each pasture will be rested for 3 years. This grazing lease would extend for 7 years from June 1, 2013 through Aug 15, 2019 thereby completing a 2 rotations initiated in 2012.

8. Description and analysis of reasonable alternatives:

Alternative A: No Action

- Improvement in vegetative condition will likely reverse. Rough fescue production may decrease.
- Decadent residual vegetation will remain, and the area will become unattractive to mule deer and other big game species.
- Mule deer, elk and other big game will likely increase utilization of adjacent private land in the spring and winter periods.
- Continued concern by some neighboring landowners regarding fire danger (build-up of vegetation) on the BLWMA.
- Public access on the Pollock Ranch may not occur.

Alternative B: Proposed Action

- Managed vegetation cycles across a 4-year rotational period, including rest periods.
- Soil and plant disturbance that will benefit seedling establishment of desirable plant species.
- Improvement in vegetative condition will likely continue. Rough fescue production will likely not diminish.
- Provide for better spring green-up vegetation conditions for elk, mule deer and other wildlife species; thereby reducing elk, mule deer and other big game usage of adjacent private property during the spring and winter months.
- Some segments of the general public may disapprove of cattle grazing on the BLWMA.
- Continued strong relations with local ranchers.
- Promote maximum plant production, vigor and nutrient content.
- Public access on the Pollock Ranch will occur on a first-come, first served basis.

If the No Action alternative is chosen, MFWP would continue to manage the WMA for the

benefit of wildlife species and for public access. Current services and maintenance of the WMA would continue. No impacts to environmental or human resources would be expected to occur.

PART II. ENVIRONMENTAL REVIEW CHECKLIST

Below is the evaluation of the impacts of the Proposed Action.

A. PHYSICAL ENVIRONMENT

1. LAND RESOURCES Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil, which would reduce productivity or fertility?			X			1b
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?			X			1d
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

1b/d. Some impacts to soil conditions may occur due to trampling, trailing or grazing in localized, high use areas, especially around water sources. The grazing capacity estimate is believed to be a conservative estimate, so the risk of overgrazing-induced erosion should be minimal. Hoof action from livestock grazing should provide a positive benefit to soil quality by helping to break down old residual vegetative material, thereby, returning nutrients to the soil.

2. AIR Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Emission of air pollutants or deterioration of ambient air quality? (Also see 13 (c).)		X				
b. Creation of objectionable odors?			X			2b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. For P-R/D-J projects, will the project result in any discharge, which will conflict with federal or state air quality regs? (Also see 2a.)		N/A				

2b. The proposed action would have no effect on the ambient air quality. Some individuals may find the smell of grazing livestock on the WMA objectionable. Livestock graze adjacent private property around the WMA, so the smell of grazing livestock is already present in the general area.

3. WATER Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?		X				
b. Changes in drainage patterns or the rate and amount of surface runoff?			X			3b
c. Alteration of the course or magnitude of floodwater or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?		X				
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. For P-R/D-J, will the project affect a designated floodplain? (Also see 3c.)		N/A				
m. For P-R/D-J, will the project result in any discharge that will affect federal or state water quality regulations? (Also see 3a.)		N/A				

3b. Live water sources are abundant on the area. While there is the potential for any snowmelt or rainstorm run-off from the area to eventually reach Blackleaf Creek, impacts on water quality, quantity and distribution will be minimal. The level of grazing recommended will leave adequate vegetative material to protect the soil and minimize potential run-off. Grazing will also not occur until late spring, after primary snowmelt has occurred.

4. VEGETATION Will the proposed action result in?	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X		No	4a
b. Alteration of a plant community?			X		No	4b
c. Adverse effects on any unique, rare, threatened, or endangered species?		X				
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?			X		Yes	4e
f. For P-R/D-J, will the project affect wetlands, or prime and unique farmland?		N/A				

4a/b. While vegetation cover and quantity will be decreased as livestock are grazing a specific pasture, vegetation quality will increase following grazing as a part of the 4-year grazing cycle. Grazing will enhance the availability and palatability of spring forage in the area and improve overall plant condition. Monitoring over the last 30 years has shown an increase in desirable plant communities. Additionally, plant and soil disturbance as the result of grazing may enhance seed placement, germination, and seedling establishment for both native and nonnative plant species. Well dispersed water resources will allow widespread livestock distribution.

The proposed grazing is expected to reduce the potential fire danger from standing vegetation in the grazed pasture. The reduction in fire fuels would be appreciated by adjacent landowners.

4e. The Department currently manages noxious weeds on the BLWMA through chemical control per the guidelines set forth in MFWP's 2008 Integrated Noxious Weed Management Plan. The acres grazed by the cattle would be monitored for new weed infestations.

5. FISH/WILDLIFE Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X			5b
c. Changes in the diversity or abundance of nongame species?	X					5c
d. Introduction of new species into an area?		X				
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X			5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?			X			5g
h. For P-R/D-J, will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f.)			X			5f
i. For P-R/D-J, will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d.)		N/A				

5 b/c/f/g. While livestock grazing activities will reduce the amount of forage in a pasture during the grazing lease cycle and temporarily displace big game from the area to be grazed, the project will have a positive long-term impact on elk, mule deer and antelope habitat. The expected short-term positive impact is that decadent residual vegetation will be removed, which should enhance spring green-up conditions and provide more palatable forage for grazing wildlife. Livestock grazing may also enhance the winter range habitat for elk and mule deer in the long term. Sufficient forage is available to elk, mule deer and other big game on the rest of the BLWMA to offset any short-term loss of forage due to livestock.

Grizzly bears are present on and around the WMA spring, summer and fall. Grizzly bear presence is recognized by the cooperating owner of the livestock to be grazed. Livestock distribution is regularly monitored and assessed to avoid direct conflict with these bears. In the event a conflict occurs, all measures will be made to favor the continued presence of the bear on the WMA.

B. HUMAN ENVIRONMENT

6. NOISE/ELECTRICAL EFFECTS Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Increases in existing noise levels?		X				
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

The proposed action would have no effect on existing noise level. Although cattle do vocalize, cattle grazing is a dominant land use in the local area and the proposed level of grazing will not significantly increase the number of cattle in the general area.

7. LAND USE Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?		X				
d. Adverse effects on or relocation of residences?		X				

Grazing activity would occur outside the time frame of any big game rifle seasons.

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?		X				
b. Affect an existing emergency response or emergency evacuation plan, or create a need for a new plan?		X				
c. Creation of any human health hazard or potential hazard?		X				
d. For P-R/D-J, will any chemical toxicants be used? (Also see 8a)		N/A				

Chemical spraying is part of FWP's weed management plan to limit the infestation of noxious weeds on its properties per guidance of the 2008 Integrated Weed Management Plan. Weed treatment and storage and mixing of the chemicals would be in accordance with standard operating procedures. No known or anticipated impacts would occur as a result of adopting this proposal.

9. COMMUNITY IMPACT Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

The proposed action would have no effect on local communities, increase traffic hazards, or alter the distribution of population in the area.

10. PUBLIC SERVICES/TAXES/UTILITIES Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify:		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased use of any energy source?		X				
e. **Define projected revenue sources						10e
f. **Define projected maintenance costs.						10f

10e. The exact amount of revenue from the grazing lease will depend upon the number of AUM's grazed X the annual grazing rate as determined by the MT Agricultural Statistics Service for each of the 7 years from 2013 – 2019.

10f. Additional costs to MFWP will include periodic monitoring of the grazing system and initial start up costs associated with layout and location of electric fence; no other costs are anticipated. Lessee will be responsible for maintenance of the pasture fences during the grazing period.

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?			X			11a
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report.)			X			11c
d. For P-R/D-J, will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c.)		X				

11a. Domestic livestock and signs of livestock use on the BLWMA may be objectionable to some segments of the public, particularly some fishermen, hikers or campers using the area as access to the Rocky Mountain Front landscape. A well established history of livestock grazing on the WMA exists, with no apparent conflicts.

11c. Livestock and livestock sign on a MFWP wildlife management area may seem out of place for some segments of the public. However, portions of the WMA have been grazed as recently as summer, 2012.

12. CULTURAL/HISTORICAL RESOURCES Will the proposed action result in:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. **Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				
d. For P-R/D-J, will the project affect historic or cultural resources? Attach SHPO letter of clearance. (Also see 12.a.)		N/A				

No impacts to cultural or historical resources are anticipated.

SIGNIFICANCE CRITERIA

13. SUMMARY EVALUATION OF SIGNIFICANCE Will the proposed action, considered as a whole:	IMPACT *					
	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources that create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects, which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?		X				
f. For P-R/D-J, is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e.)		N/A				
g. For P-R/D-J, list any federal or state permits required.		N/A				

Evaluation and listing of mitigation, stipulation, or other control measures enforceable by the agency or another government agency:

The grazing lease agreement between MFWP and the lessee would include all lease stipulations and enforceable control measures. These are identified in the lease agreement and pertinent attachments to same.

PART III. NARRATIVE EVALUATION AND COMMENT

The proposed grazing lease on the Blackleaf WMA will be used to improve vegetative conditions for big game species that may utilize the WMA particularly during the spring and winter time periods.

The proposed project is not expected to have significant impacts on the physical or human environment. Identified impacts are expected to be minor and of short duration. The project is expected to benefit wildlife habitat conditions in the long-term. These are borne out by the recent 8-year history of grazing under similar conditions on this same WMA.

PART IV. PUBLIC PARTICIPATION

1. Public involvement:

The public will be notified in the following manner to comment on this current EA, the proposed action and alternatives:

- Two public notices in each of these papers: Choteau: *Choteau Acantha* and Great Falls: *Great Falls Tribune*;
- Public notice on the Fish, Wildlife & Parks web page: *http://fwp.mt.gov*.

Copies of this environmental assessment will be distributed to neighboring landowners and interested parties to ensure their knowledge of the proposed project.

This level of public notice and participation is appropriate for a project of this scope having limited and very minor impacts, which can be mitigated.

2. Duration of comment period:

The public comment period will extend for twenty-one (21) days. Written comments will be accepted until 5:00 p.m., March 8, 2013 and can be mailed to the address below:

Blackleaf WMA Grazing Lease
Montana Fish, Wildlife & Parks
514 South Front Street, Suite C
Conrad, MT 59405 or email at: rrauscher.fwp@gmail.com

PART V. EA PREPARATION

1. Based on the significance criteria evaluated in this EA, is an EIS required? (YES/NO)? No
If an EIS is not required, explain why the EA is the appropriate level of analysis for this proposed action. It has been determined that no significant impacts to the physical and human environment will result due to the proposed action alternative, nor will there be significant public controversy over the proposed action; therefore, an Environmental Impact Statement is not required.

2. Person responsible for preparing the EA:
Ryan L. Rauscher, MFWP Area Wildlife Biologist
514 South Front Street, Suite C
Conrad, MT 59425
406-271-7033

APPENDICES
A. Blackleaf WMA legal descriptions
B. Blackleaf Wildlife Management Area Vegetation Condition and Trend 1979-2009
C. Grazing Plan – Blackleaf WMA, 2013 - 2019
D. Pollock Ranch Proposed Public Hunting Access

APPENDIX A

LEGAL DESCRIPTION FOR BLACKLEAF WMA

File #	TWP	Range	Sec	Description
4077.1(01)	T25N	R08W	03	LOTS 3 AND 4
			04	LOTS 1 AND 2
	T26N	R08W	20	S ½
			21	ALL
			22	W1/2NE1/4, W1/2, SE1/4
			26	W1/2NE1/4, W1/2, NW1/4SE1/4 - SEE DISPOSALS
			27	ALL
			28	ALL
			29	LOTS 1, 2, 3, & 4 AND W1/2E1/2, NW1/4, NE1/4SW1/4, S1/2SW1/4
			30	E1/2NE1/4, SE1/4SE1/4
			31	NE 1/4NE1/4, S1/2NE1/4
			32	N1/2, E1/2SW1/4, SE1/4
			33	ALL
			34	NE1/4, W1/2
4077.1 (02)	T26N	R08W	19	LOTS 1 & 2 AND NE1/4NW1/4, N1/2NE1/4, SE1/4NE1/4
4077.1 (03)	T26N	R08W	19	LOT 4, SE1/4SW1/4, S1/2SE1/4
			30	LOT 1, NW1/4NE1/4, NE1/4NW1/4
4077.1(05)	T26N	R08W	08	SE1/4SW1/4, S1/2SE1/4, CONTAINING 120.00 ACRES
			09	LOTS 6 & 7, W1/2SE1/4, SW1/4 CONT. 326.03 ACRES
			10	SW1/4SW1/4 CONT. 40 ACRES
			15	W1/2NW1/4 CONT. 80 ACRES
4077.1(06)	T26N	R08W	19	LOT 3, S1/2NE1/4, NE1/4SW1/4, N1/2SE1/4. CONSISTING 234.57 ACRES AND SUBJECT TO EASEMENTS FOR RECORD, RESERVATIONS AND EXCEPTIONS. (SEE HARD FILE.)
4077.1 (07)	T26N	R08W	14	S1/2S1/2
			15	S1/2
			16	LOTS 3, 6, AND 7
			17	LOTS 3, 4, W1/2SE1/4, SW1/4
			20	LOTS 1, 2, 3, 4, 5, SW1/4NE1/4, S1/2NW1/4
			22	E1/2NE1/4
			23	N1/2
4077.1(08)	T26N	R08W	07	LOTS 5, 6, 7, E1/2SE1/4, SE1/4 CONTAINING 350.20 ACRES
			08	SW1/4SW1/4 CONT. 40.00 ACRES
			17	LOTS 1 & 2, W1/2NE1/4, NE1/4NW1/4, SW1/4NW1/4 CONT. 240.00 ACRES
			18	LOTS 1, 2, & 4, E1/2W1/2, E1/2 CONT. 590.61 ACRES

APPENDIX B: **Pollock Ranch Proposed Public Hunting Access**

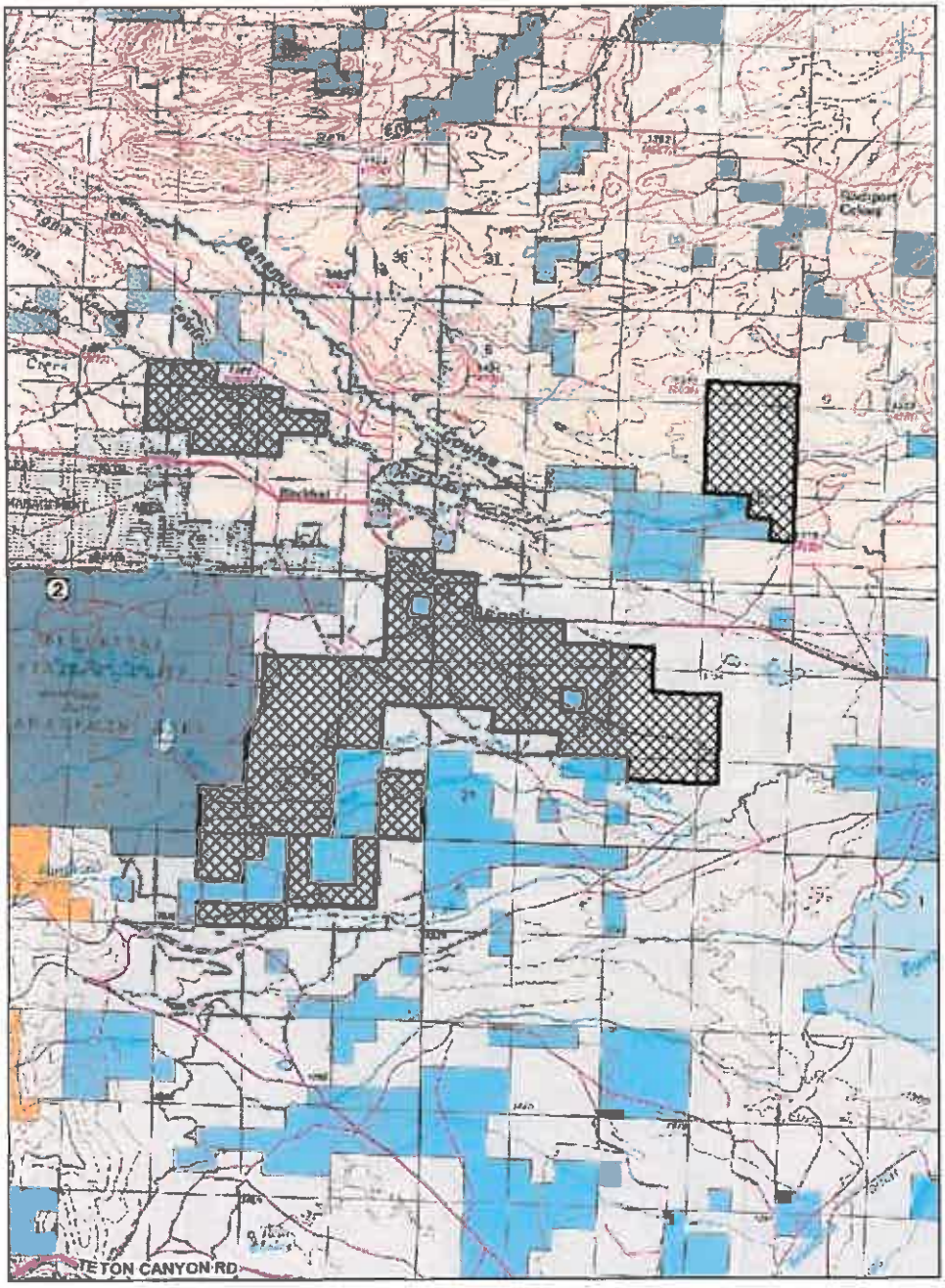


Figure 1. Proposed Hunter Access (Crosshatch Areas) on Pollock Ranch adjacent to the Blackleaf WMA.

APPENDIX C

Grazing Plan – Blackleaf WMA

Blackleaf WMA Grazing Plan and Special Conditions for Pollock Ranch Lease 2013 – 2019.

	Pasture									
Year	**1**	**2**	**3**	**4**	**5a**	**5b**	**6**	**7**	**8a**	**8b**
2013				graze			graze		graze	
2014		*graze*			*graze*					
2015			*graze*			*graze*				
2016	*graze*							*graze*		graze
2017				*graze*			*graze*		graze	
2018		*graze*			*graze*					
2019			*graze*			*graze*				

Pasture 5 is designed to be divided into two pastures, 5a and 5b. Some pastures are larger than others, resulting in more available AUMs some years.

Special Conditions

1. A maximum of 1,500 and a minimum of 500 AUMs will be provided. The rental due the Department of Fish, Wildlife and Parks will be the statewide private land grazing rate average for that year. Annual payments will vary, depending upon size of pastures, numbers of cattle and growing conditions.
2. All livestock grazing (for purposes of this lease agreement) on the Blackleaf Wildlife Management Area shall be restricted to pastures located in T26N, R8W, Sections 14, 22, 23, 26, 27, 28, 29, 30 and 34, (portions thereof) as designated on attached map.
3. The lessee agrees to maintain pasture fences in good functional condition (barbed and electric). The Department agrees to purchase necessary pasture fencing and equipment.
4. Salt and mineral supplement is the responsibility of the lessee; salt grounds shall be moved periodically as designated by the Department representative.

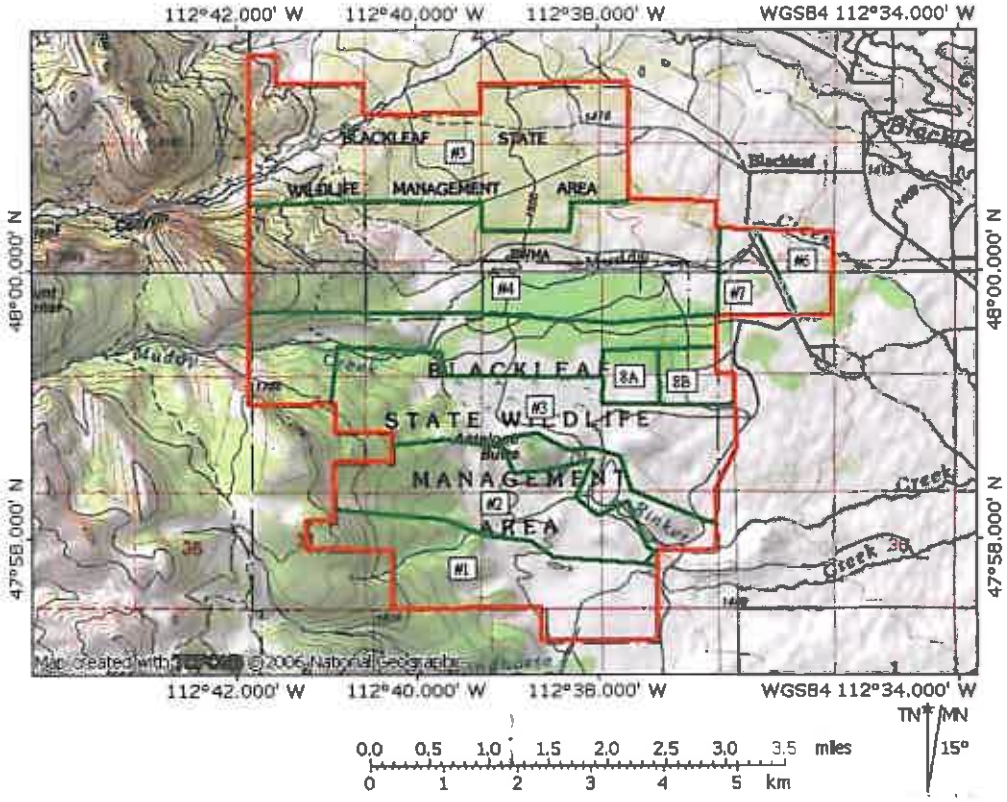


Figure 2. Area of Blackleaf WMA to be grazed during the course of a 4-year rest-rotation grazing system.

APPENDIX D

Blackleaf Wildlife Management Area Vegetation Condition and Trend 1979-2009

Blackleaf Wildlife Management Area
Vegetation Condition and Trend, 1979-2009

Prepared by: Gary Olson
MT Fish, Wildlife, and Parks
Conrad, MT
April, 2011

Table of Contents

List of Figures

Introduction

The Blackleaf Wildlife Management Area (BLWMA) lies in the foothills of the Sawtooth Range of the Rocky Mountains east of the Continental Divide, in northwestern Teton County (see map, Appendix 1). Great Falls, Montana, is 85 miles south and east from the BLWMA. Montana Department of Fish, Wildlife and Parks owns and manages the 11,107-acre unit for vegetation and wildlife enhancement as well as public recreation.

Topography varies from flat, sub-irrigated meadows and marshes to rolling hills to high timbered and rocky outcrops on the west boundary of the property. Several small streams run from west to east. Elevation varies from 4,300 to 6,700 feet. Annual precipitation ranges from 15-20 inches.

The BLWMA originated in 1979, followed by several additional land purchases to provide winter range for elk and mule deer. The area is considered important spring and summer habitat for black and grizzly bears, and, due to habitat diversity and arrangement, provides important habitat for game and non-game birds, mammals, reptiles and amphibians.

One of the primary goals for the BLWMA is to emphasize the occurrence of highly productive, diverse plant communities that will provide the best possible quality forage and cover for native wildlife species. Prairie vegetation is managed with emphasis on rough fescue (Festuca scabrella) because of its palatability to big game species. Rough fescue is considered a climax species in mountain-foothill zones of Montana which provides benchmarks for determining rangeland condition (Ross, Murray and Haigh, 1973, and Ross and Hunter, 1976). The species is also a preferred winter forage by elk (Jourdonnais and Bedunah, 1990). It is therefore considered an indicator of overall grassland health. Numerous studies have shown that, if this plant is carefully managed, the entire plant community moves toward a more productive, vigorous climax. The rough fescue/Idaho fescue habitat type as described by Mueggler and Stewart (1980) and Harvey (1980) is one of the most productive in western Montana.

A range condition and trend survey initiated shortly after purchase in 1979 revealed that the majority of the grasslands on the BLWMA were in fair condition, based upon Soil Conservation Service (now NRCS) range condition criteria (poor, fair, good, excellent). As a result the entire area was rested from livestock grazing through 1989 in order to allow plant communities to regain vigor and productivity. Eleven years of rest allowed plants to recuperate without intensive livestock grazing pressure. Permanent vegetation transects were established in 1979 and re-read in 1986-87, 1993, 1997, 2001, 2005 and 2009. Several range sites were sampled specifically because of poor soils and exposure. Sites with deeper and richer soils have shown a more dramatic increase in range condition.

In June of 1990, a rotational grazing system was initiated utilizing livestock from neighboring ranches (Olson, 1992). The grazing system is designed to duplicate, as nearly as possible, natural ungulate grazing. Each unit is grazed for 6-7 weeks, beginning approximately June 1, and then allowed complete rest for 3 full growing seasons. Pasture units 1-8 provide livestock grazing on the WMA (see Appendix 1). Units are maintained using portable solar-powered electric fencing. Electric fences are removed at the end of each grazing season.

Methods

Fourteen permanently marked transects were established on the BLWMA immediately after purchase in 1979 (Appendix 2). Steel posts identify each transect, with shorter lengths of rebar 100 feet apart marking the beginning and end. A 100-foot tape is stretched between the rebar stakes and measurements recorded at 5-foot intervals (beginning at the 5-foot marker on the tape). A 20x50 centimeter quadrat is used to record basal cover and frequency for all species encountered. Twenty samples are collected from each 100-foot transect. Ocular basal cover (%) values are collected at approximately 1 inch above ground to accommodate measuring "mat-forming" species that spread laterally along the ground surface.

Data from 14 transects were recorded during summers of 1979-80, 1986-87, 1993, 1997, 2001, 2005 and 2009.Transect locations are presented in Appendix 2. Basal cover values for all years are summarized in an Excel spreadsheet format (Appendix 4). Transects were read from late June through late August.

A regression equation and trend line comparing percent relative basal cover values over the past 30 years is used to evaluate individual plants' changes compared to the total vegetative community. R-squared correlation coefficients of 0.50 or more are considered benchmarks to indicate the presence or absence of a significant relationship (Fowler and Cohen 1993).

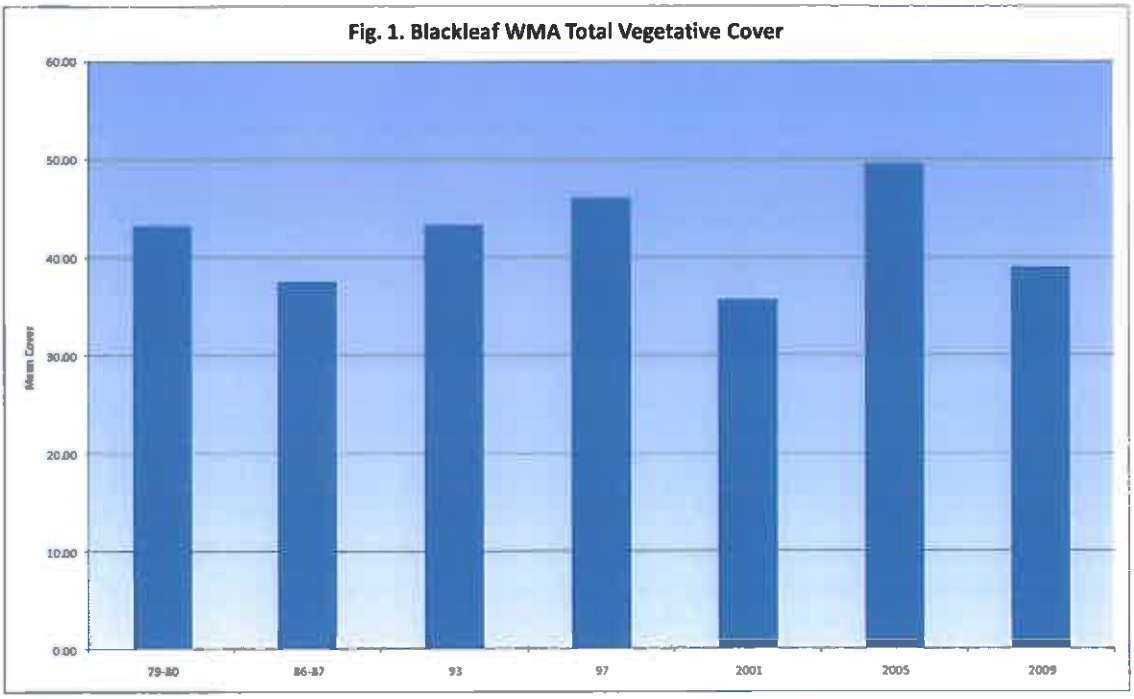
Results and Discussion

General Trends – Mean Percent Basal Cover/Relative Cover

Overall, vegetation condition has improved on sampled areas of the BLWMA. Vegetation condition and trend are estimated based upon mean basal cover and relative cover values for individual plant species. Mean basal cover is derived from the average percent cover for each species per transect divided by the total number of transects. Relative cover, or composition, is the mean percent cover for each individual species divided by the mean total percent plant cover. Relative cover records the changes in individual plants compared to rest of the plant community. Mean percent basal cover values for 9 grasses and sedges plus 23 forbs and shrubs were tabulated and summarized by transect (Appendix 4) and are considered the more important plants in terms of frequency of occurrence and basal cover values in the plant community. Approximately 60

less abundant species or species groups were summarized but are not included in the Appendix 4 summary.

Total vegetative cover for 92+ plant species over the 30-year period varied between 35% and 50%, with no consistent trend over time (Figure 1). The lowest recorded value for total cover (35%) occurred in 2001, coinciding with severe drought conditions during that same year.



Relative cover (composition) values for total grasses and forbs/shrubs generally showed a very significant decline in forb/shrub cover and a very significant increase in grasses (Figures 2 and 3). Much of the variation in forb/shrub cover was due to an overall increase in one shrub species, horizontal juniper, which masked a more accelerated decline in most other forb and prairie shrub species. In addition, severe drought conditions during 2001 appeared to interrupt plant cover trends.

Ten species of grasses, forbs and shrubs that are the most frequently encountered and account for the greatest cover values during sampling efforts from 1979-2009 are compared in Figures 4 - 6. These species accounted for 48.6 % of the plant community cover in 1979 compared to 66.4% in 2009. Rough fescue (Fesc) and horizontal juniper (Juho) are major contributors to these changes. Idaho fescue (Feid) and Parry danthonia (Dapa) showed minor cover increases over the 30 year period, while fringed sagewort (Arfr), phlox species (Phal, Phho), shrubby cinquefoil (Pofr), prairie junegrass (Kocr) and pussytoes (Anro) were either stable or declining.

Fig. 2. Grass Cover Trends

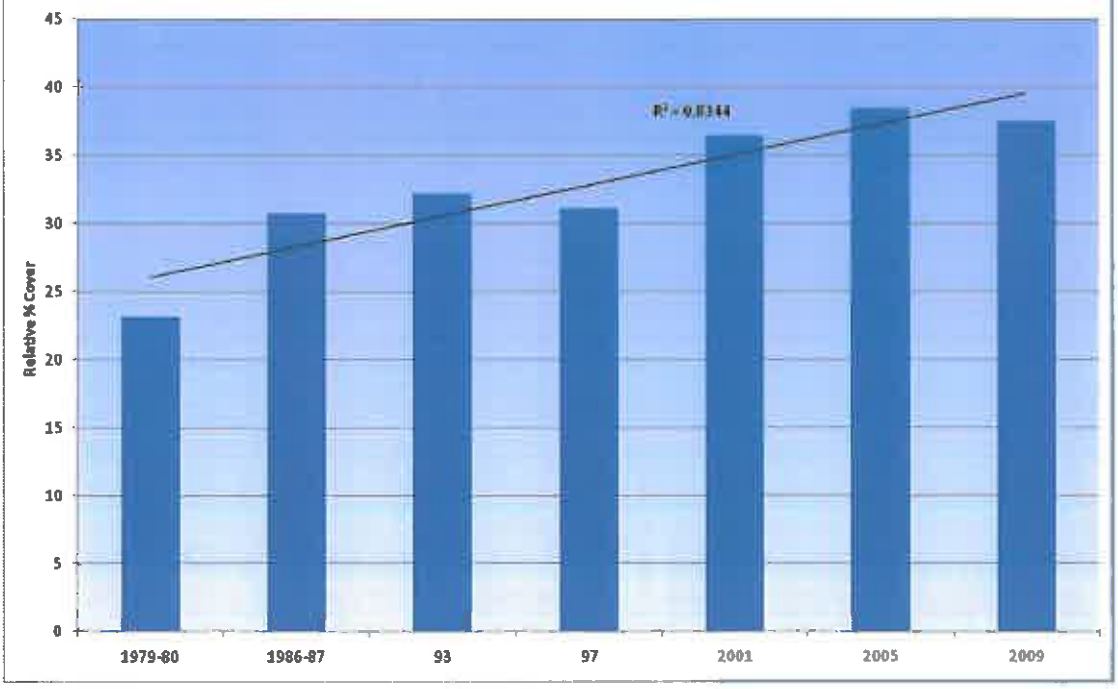


Fig. 3. Forb/Shrub Cover Trends

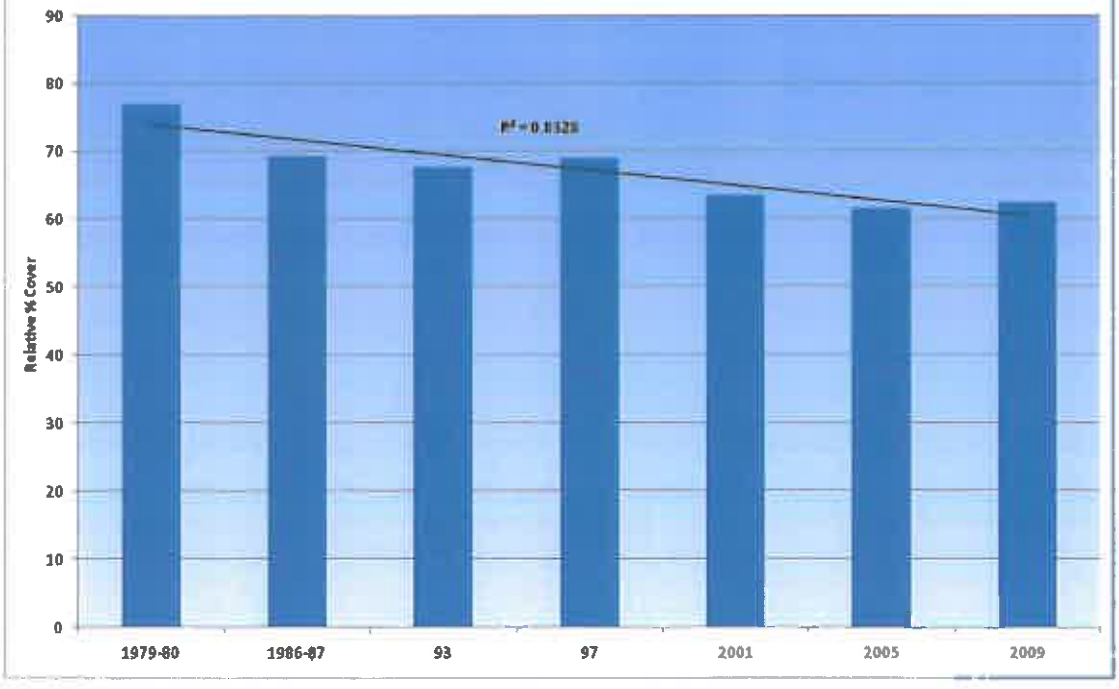


Fig. 4. 1979 Blackleaf WMA Relative Plant Cover %
(10 spp. = 48.6 % of total plant cover)

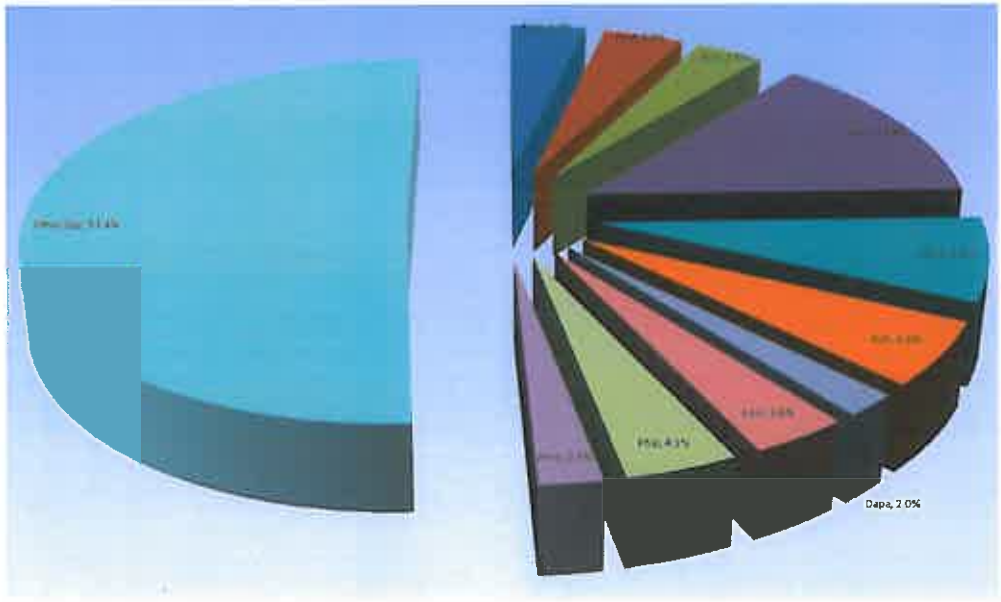
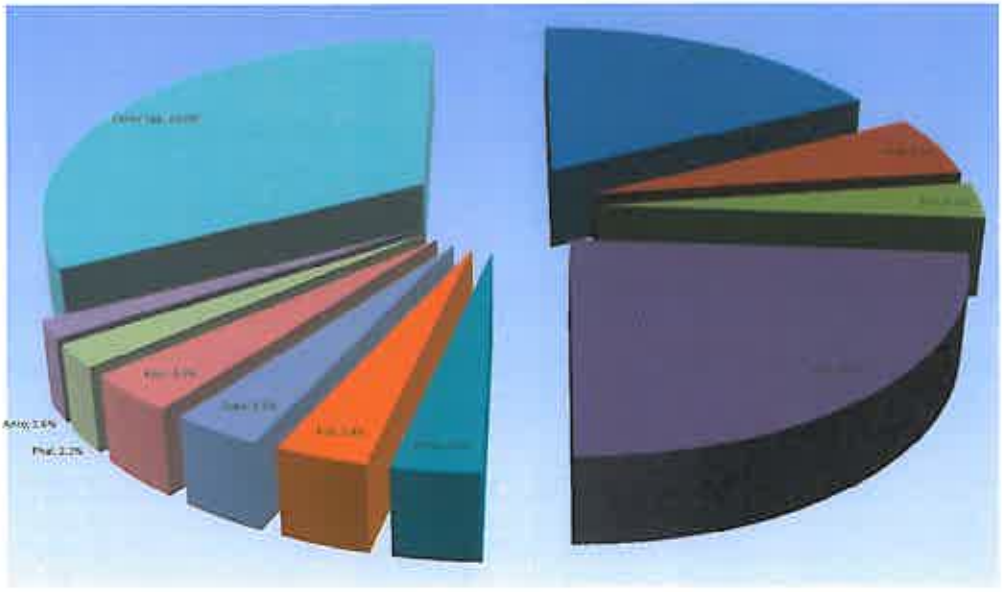
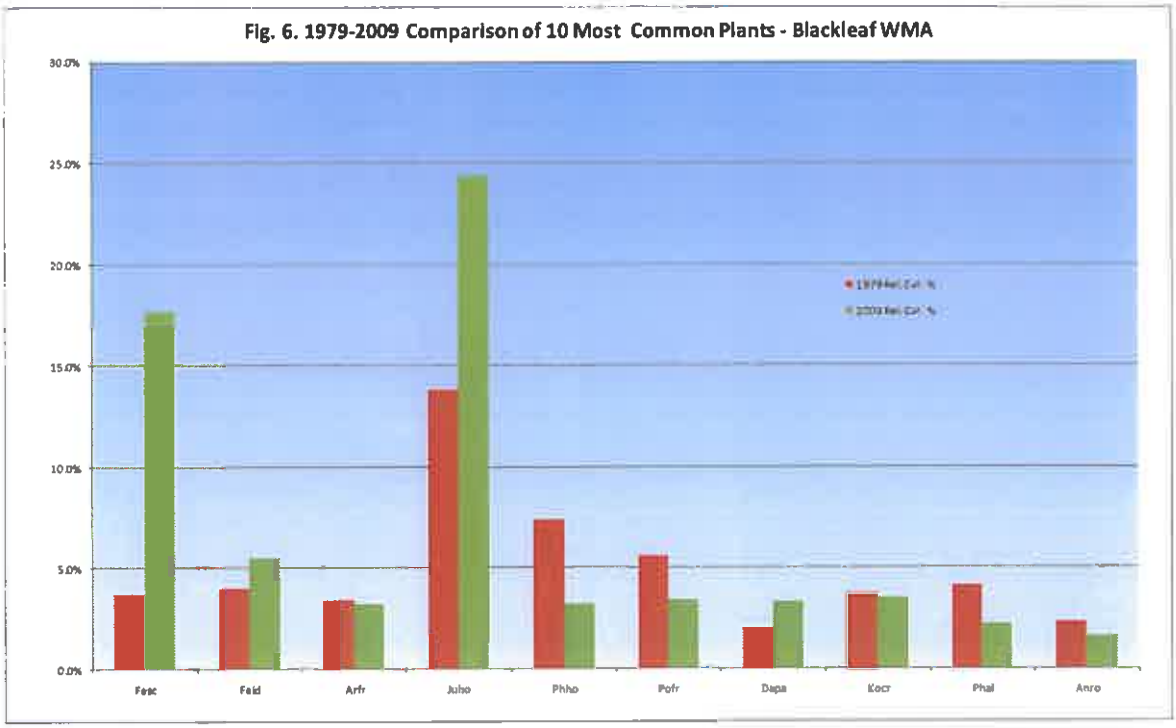


Fig 5. 2009 Blackleaf WMA Relative Plant Cover %
(10 spp. = 66.4% of total plant cover)





Individual Species' Response – Relative Cover (Composition)

Composition values compiled over 30 years (7 sampling periods) for the 10 individual species of greatest abundance are presented in Figures 7- 10, and Appendix 3. It is important to note that rest-rotation livestock grazing was initiated on the Blackleaf WMA in 1990 and continued through 2009. Since almost all of the permanently marked transects are located within grazed areas since 1990 a grazing/non-grazing comparison is not possible. Transects marked with an asterisk in Appendix 4 tables were ungrazed from approximately 1990-2000, but are currently grazed.

Figure 7 illustrates the basal cover relationship of rough fescue to the rest of the plant community as recorded over a 30 year period. This graph represents a steady increase in basal cover. A simple linear regression was used to compare cover values over the 7 sampling periods. The correlation coefficient (R squared) of 0.79 suggests a strong upward trend over the sampling period. Overall, rough fescue cover in 2009 was four times the 1979 value.

Figure 8 shows a similar increasing trend in growth for horizontal juniper over the 30 year period, with a significant corresponding R squared value of 0.66. Juniper cover has quadrupled since 1979, although showing very slight declines in 2005 and 2009 sampling efforts.

Fig. 7. Festuca scabrella (rough fescue)

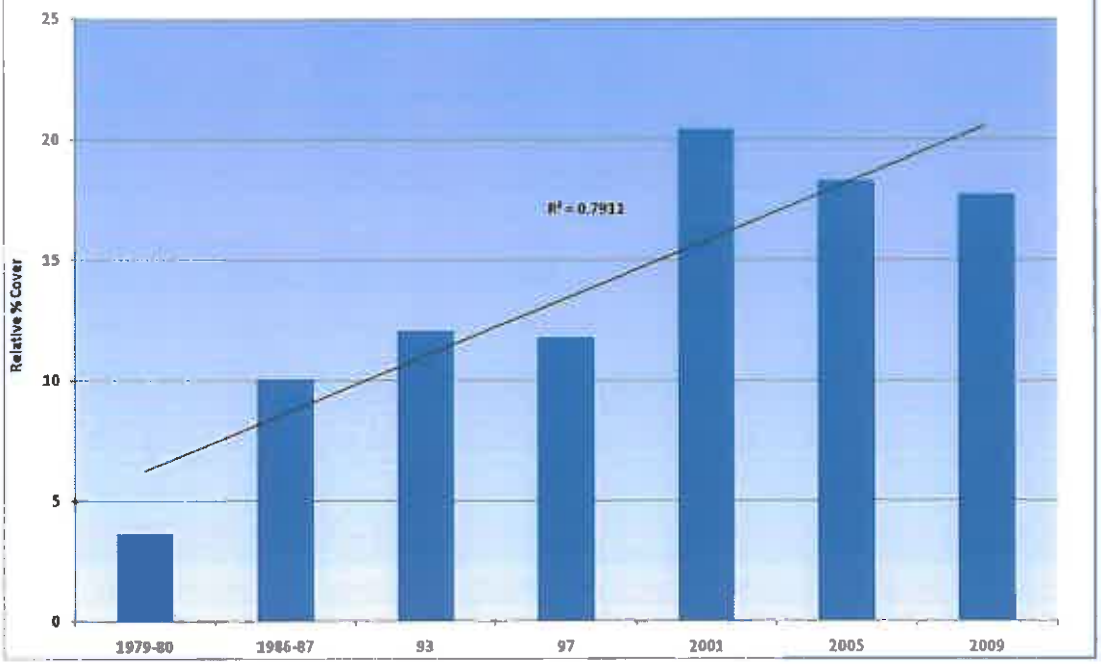
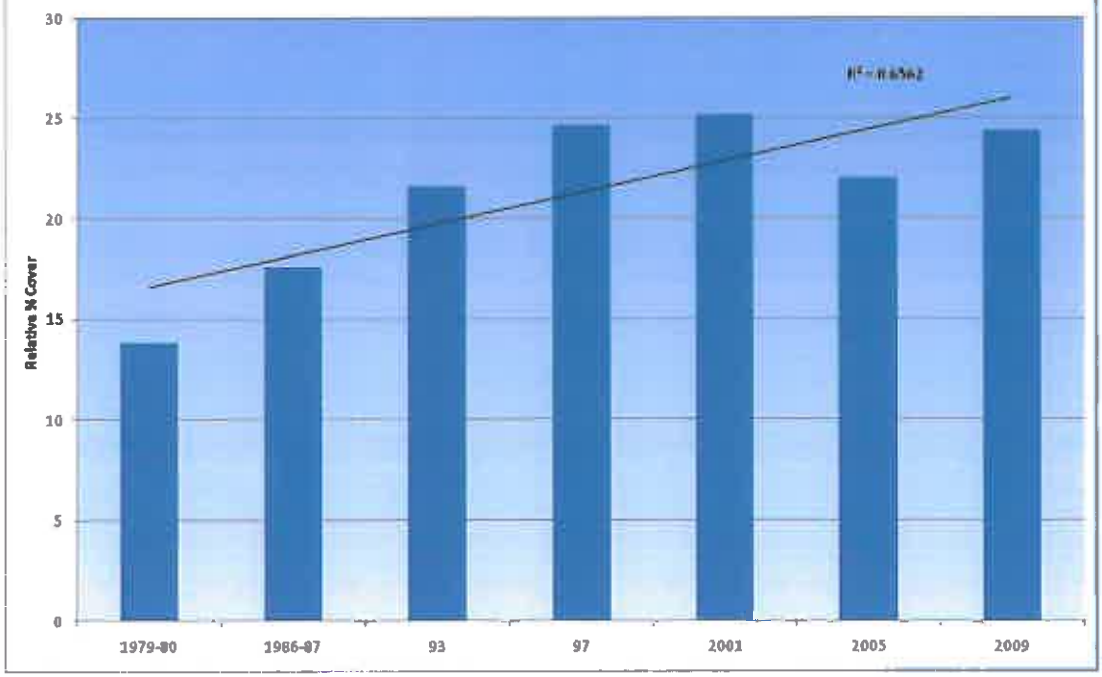


Figure 8. Juniperus horizontalis (Juniper)



Two species that revealed a marked decline in relative percent basal cover that were included in the more abundant top ten are illustrated in Figures 9 and 10. Hood's phlox has shown a significant decline as expressed by an R squared value of 0.75. The species was much more abundant from 1979-1987, but diminished steadily after 1987.

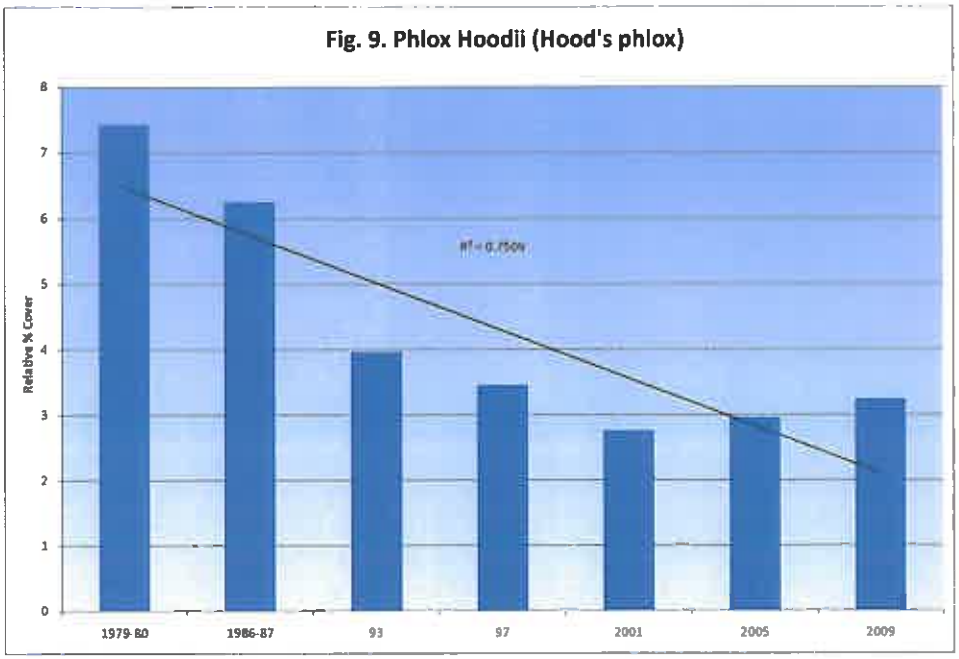


Fig. 9. Phlox Hoodii (Hood's phlox)

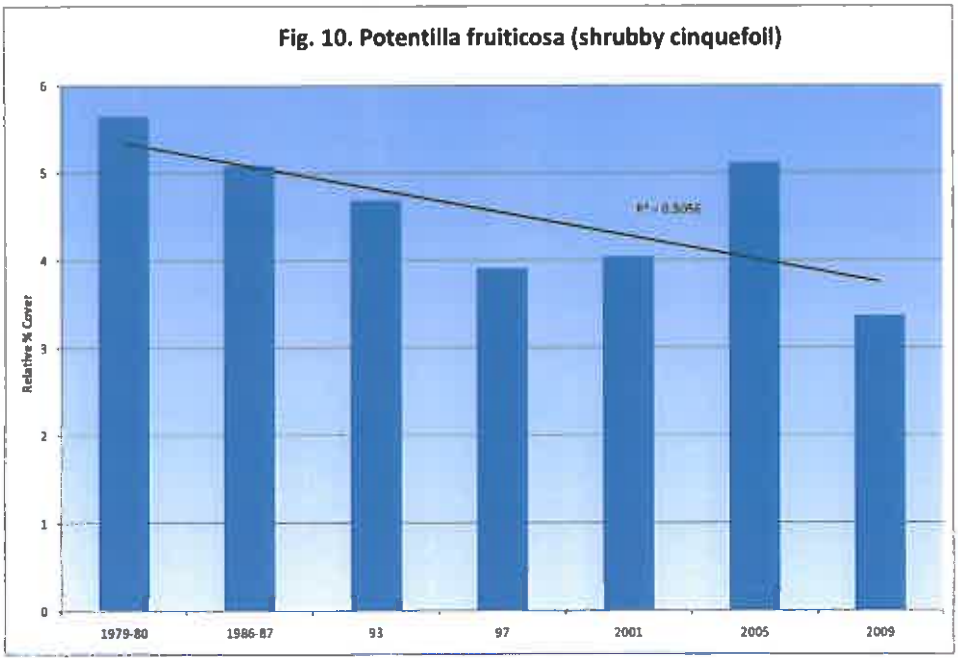


Fig. 10. Potentilla fruiticosa (shrubby cinquefoil)

Shrubby cinquefoil has declined steadily over the 30 years sampling occurred, with only a minor variance noted in 2005. An R squared value of 0.51 would indicate a moderate– strongly significant difference over time. This data might be important to show to other range managers who are frequently encouraged to "spray out" woody species that are perceived to hamper grass production. Sharptailed grouse utilize this species for nesting cover and lek activities. In overgrazed areas, remnant species of palatable decreasers are frequently found in and around the crowns of cinquefoil; eradicating the plant only exposes these valuable remnant species to further grazing damage.

Of the 6 remaining dominant plant species, 3 showed no obvious upward or downward cover trends, although shorter term trends were noted for some species (see Appendix 3). These species include Parry oatgrass, Idaho fescue, and prairie junegrass.

In the case of Parry oatgrass, large increases were recorded through 1993, followed by declines through the rest of the 16 year observation period. Fluctuations in the cover data over the 30 years therefore showed no consistent trend. This species is a suspected competitor with rough fescue under intensive grazing conditions, but doesn't appear to be restricting rough fescue expansion on the Blackleaf WMA.

Prairie junegrass and Idaho fescue displayed similar results in that cover values varied widely between sampling periods, so that no clear trends in cover were observed.

The remaining 3 species, fringed sagewort, phlox, and pussytoes all (similarly) showed higher cover values from 1979 through 1987, then declines through 2009 (see Appendix 3).

Noticeable or obvious cover trends for other dominant species or species groups (of the 32 listed) in Appendix 3 include mountain douglasia, lupine, locoweed species, stemless nailwort, rose, and yellow pea.

Mountain douglasia, one of the earliest blooming "cushion plants" along the Rocky Mountain Front declined significantly over the past 30 years. Similar trends were observed for lupine, locoweed species, and stemless nailwort. Yellow pea declined dramatically in the first few years after FWP purchased the property and then remained at low levels. Rose increased also over the 30 year period, but below the selected level for significance.

Conclusions

Analysis of vegetation data from the past 30 years (1979-2009) indicates a significant increase in overall grass cover and a significant decline in forb/shrub

cover on the BLWMA. Range condition has improved to "good-excellent" status (by NRCS standards applied in 1979) based upon significant improvement in rough fescue cover and declining influence of several forb species. Total vegetative cover (of all species) varies (35-48%) by sampling period and shows no significant upward or downward trend. Rough fescue, a very important deer and elk winter/spring forage species, has increased significantly in basal cover. Horizontal juniper, an important browse for mule deer in mountain-foothill prairie habitats, also exhibited a significant increase over the 30 year period.

Ten plant species that contributed approximately 49% of total ground cover value in 1979 increased to over 66% in 2009. These species include rough fescue, Idaho fescue, Parry danthonia, prairie junegrass, horizontal juniper, fringed sagewort, Hood's phlox, shrubby cinquefoil, phlox and pussytoes. However, rough fescue and horizontal juniper were major contributors to the cumulative increase in cover by these ten species. Idaho fescue and parry danthonia exhibited very small increases in cover over the thirty year period. While prairie junegrass cover remained static, the remaining 5 forbs, Hood's phlox, phlox, fringed sagewort, shrubby cinquefoil, and pussytoes, declined.

Six other commonly occurring forbs in the sampling area that showed significant downward trend in basal cover from 1979-2009 include mountain douglasia, stemless nailwort, lupine, and loco weed (Oxytropis spp.). Increases in rose cover were slightly below the selected threshold r-squared value of 0.50 (0.47) to indicate significant upward change.

Only two of fourteen permanently marked transects were located out of livestock grazing units, so it is difficult to compare vegetation information between grazed and ungrazed areas. It is apparent that the livestock grazing system initiated in 1990 has had no obvious negative impacts on the plant species discussed here, and, has likely contributed to the overall increase in beneficial species such as rough fescue.

Shrubby cinquefoil, a common shrub in open grassland habitats on the WMA, has declined over the past thirty years. This plant, a known increaser under intensive grazing, is often targeted for spraying, mowing and burning as a means of control by local ranchers who believe it out-competes valuable livestock-preferred grasses. This data may indicate that under proper grazing management, the species will decline without expensive treatments that may be harmful to wildlife. For instance, cinquefoil is important for sharptailed grouse lek selection, providing cover from aerial and ground predators. Thus, removal of extensive stands of cinquefoil will have negative consequences for sharptailed grouse. In addition, on severely over-grazed ranges, remnants of climax grasses, such as rough fescue, can persist under the shrub's crown. Short-term measures to control the shrub may expose the grasses to excessive grazing pressure and eventually eliminate them, which erases any hope of range rehabilitation with existing native climax species. This data suggests that rotational grazing with

adequate rest periods may reduce the species' cover without resorting to more harsh chemical and mechanical control methods.

Horizontal juniper, like shrubby cinquefoil, is often targeted by ranchers as a major contributor to declining grass production. The sample data indicates that under proper rest periods and rotation of livestock grazing, this important browse species will not negatively impact range condition and continue to provide valuable mule deer forage.

Finally, the thirty-year period of sampling on the Blackleaf WMA would suggest that significant vegetation changes are generally not obvious over a period of a few years. Vegetation monitoring of permanently marked transects on wildlife management areas and conservation easements is critical and should be encouraged at the time of acquisition in order to avoid erroneous conclusions based upon short-term trend information.

Literature Cited

Fowler, J. and L. Cowen. 1993. Practical Statistics for Field Biology. John Wiley & Sons, U.K. 227pp.

Harvey, S.J. 1980. The potential and current vegetation of the Sun River game range. Montana Department of Fish, Wildlife, and Parks. Helena.82p.

Jourdonnais, C.S. and D. J. Bedunah. 1990. Prescribed fire and grazing on an elk winter range in Montana. Wildl. Soc. Bull. 18:232-240.

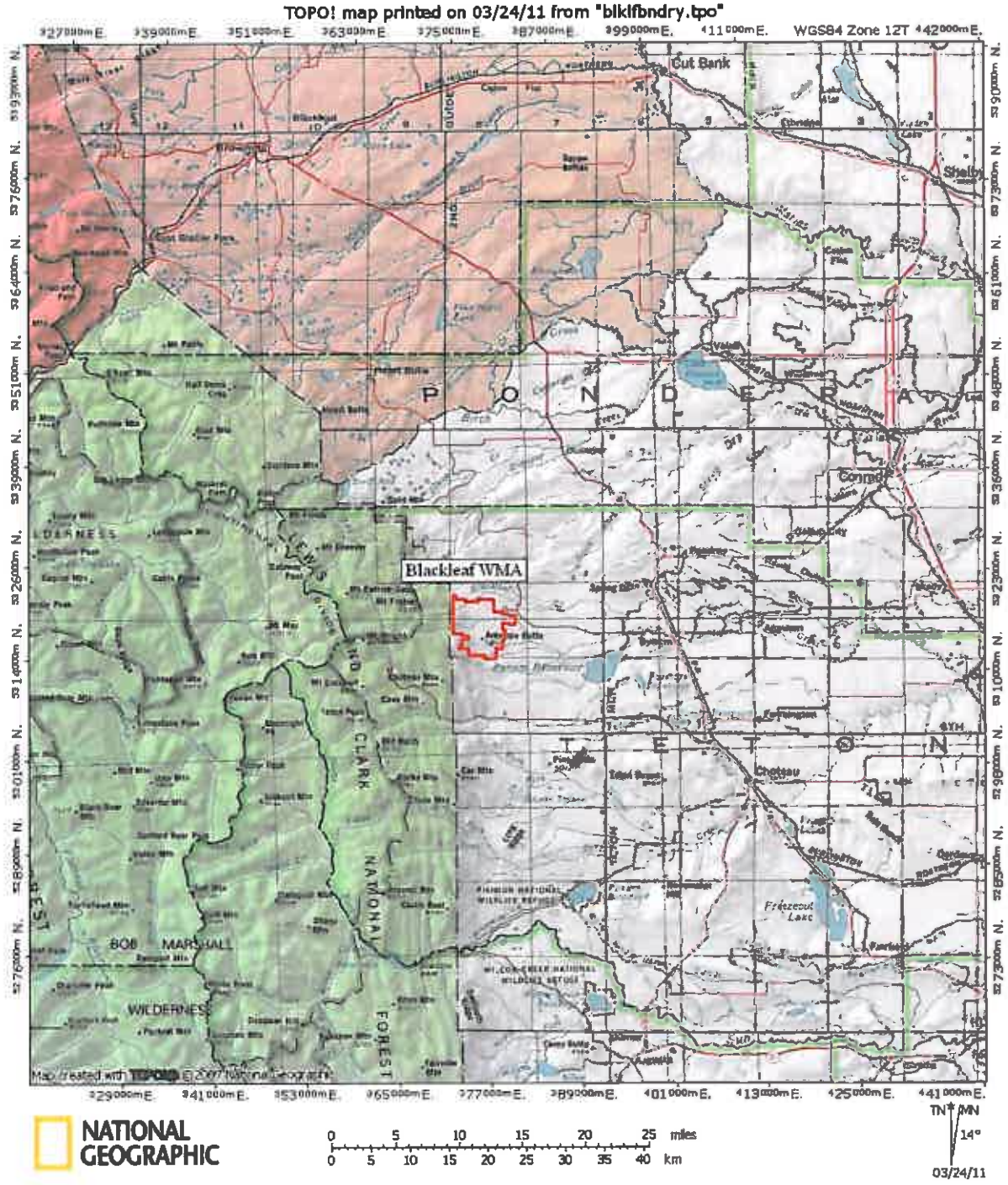
Mueggler, W.F. and W. L. Stewart. 1980. Grassland and shrubland habitat types of Western Montana. USDA Forest Service General Technical Report INT-66.154p.

Olson, G.R. 1992. Beefing up the Blackleaf. Montana Outdoors. March-April 1992:27-30.

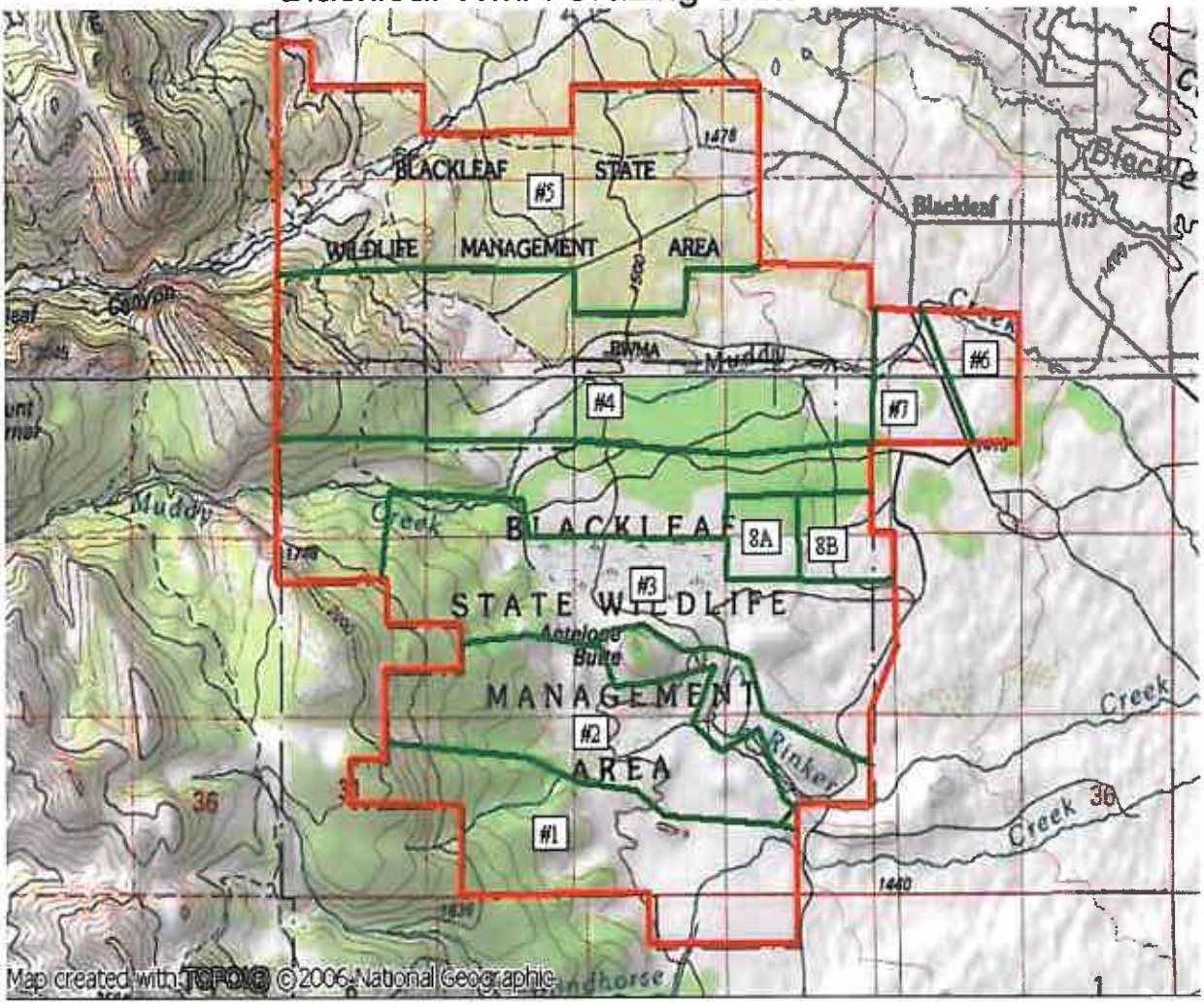
Ross, R.L., E.P. Murray, and J.G. Haigh. 1973. Soil and vegetation inventory of near-pristine sites in Montana. USDA Soil Conservation Service. Bozeman, Mt. 55p.

Ross, R.L. and H. E. Hunter. 1976. Climax vegetation of Montana. USDA Soil Conservation Service. Bozeman, MT. 64p.

Appendix 1.
Blackleaf WMA Location Map

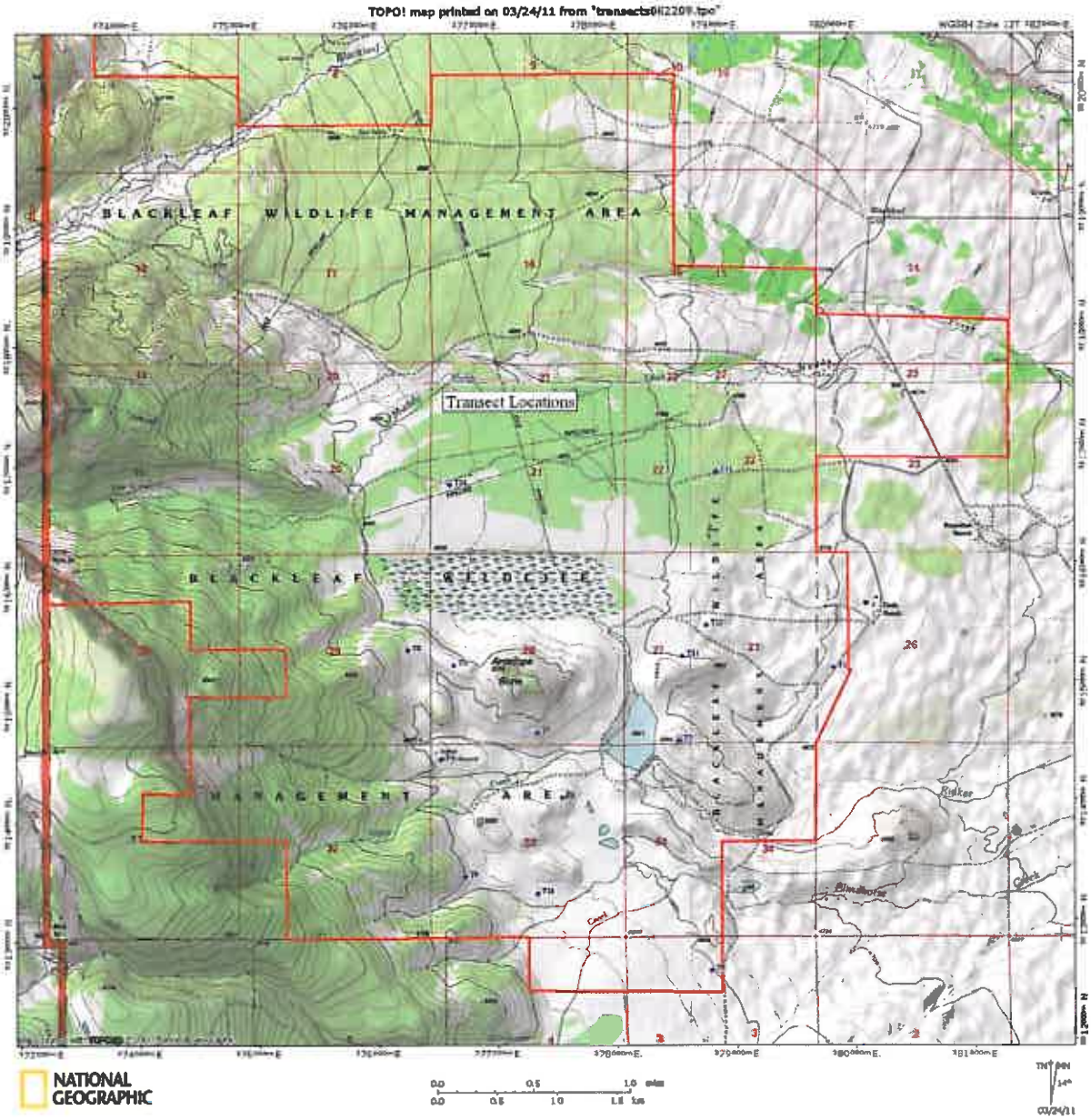


Blackleaf WMA Grazing Units



Appendix 2.

Blackleaf WMA Vegetation Transect Locations



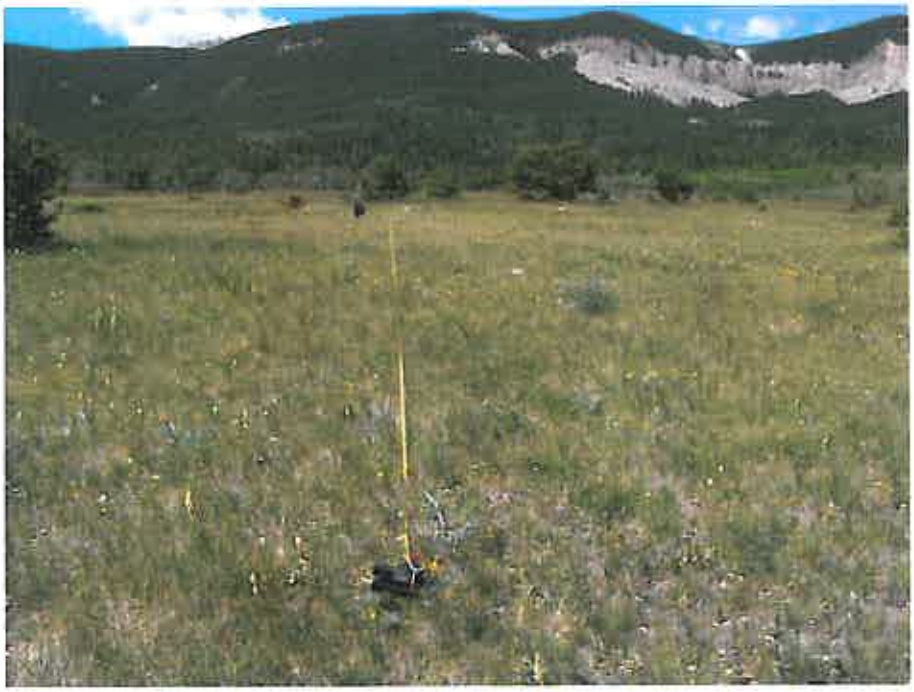
Blackleaf Wildlife Management Area Vegetation Transect Locations			
Transect #	GPS Coord - UTM		Site Description
1	12T - 0379875	5315150	SW Ostle buildings, just west of trail - runs west
2	12T - 0378560	5314563	On hill east of Lake - runs north
3	12T - 0376692	5315238	West of Antelope Butte - runs SW toward Ear Mtn
4	12T - 0376587	5314449	Graveyard/battle site area, just east of travois trail 25 yds - runs east
5	12T - 0378793	5312629	SE corner of WMA - runs west
6	12T - 0377578	5314108	Hill south of Rinker Creek and Antelope Butte - runs south toward Dry Coulee Notch
7	12T - 0377382	5314652	South face of Antelope Butte - runs north, uphill
8	12T - 0376308	5315375	West of Antelope Butte, west of Old North Trail in limber pine - runs ssw
9	12T - 0376750	5313463	Clark Fork Muddy Creek, east facing slope - runs sw along contour of hill
10	12T - 0377353	5313310	east of #9 on terrace between two drainages - runs nw toward Mt Frazier
11	12T - 0378607	5315278	east of Antelope Butte on north facing hill - runs wsw slightly uphill
12	12T - 0378811	5315529	On flat area south of H fence brace - 75 yards south of trail leading up to east end of swamp
13	12T - 0378911	5316825	North side of Muddy Creek Road - runs east
14	12T - 0376685	5316770	South side Muddy creek Road - runs south

Transect #1

Transect #2

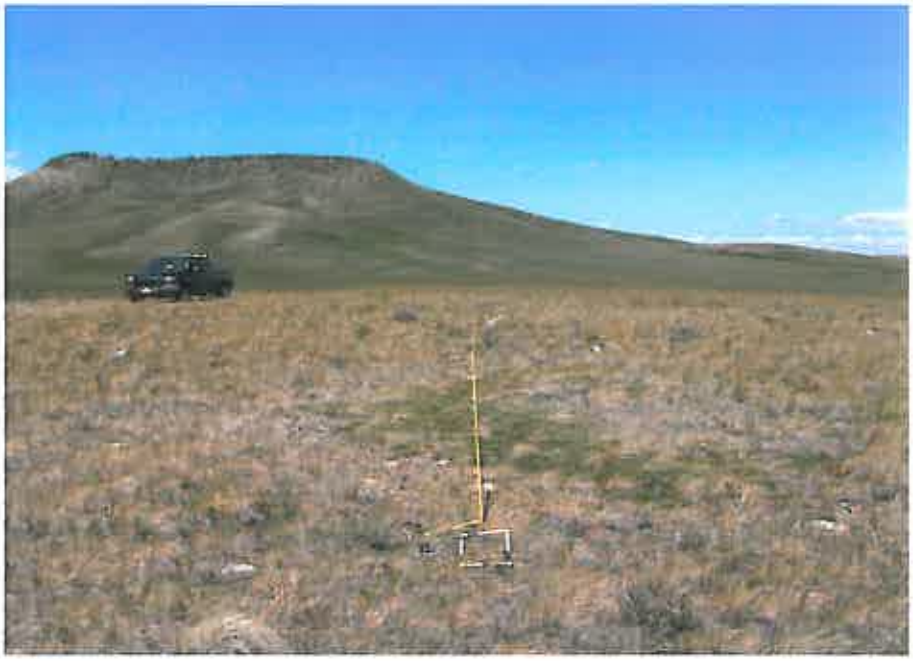
Transect #3

Transect #4



Transect #5

Transect #6



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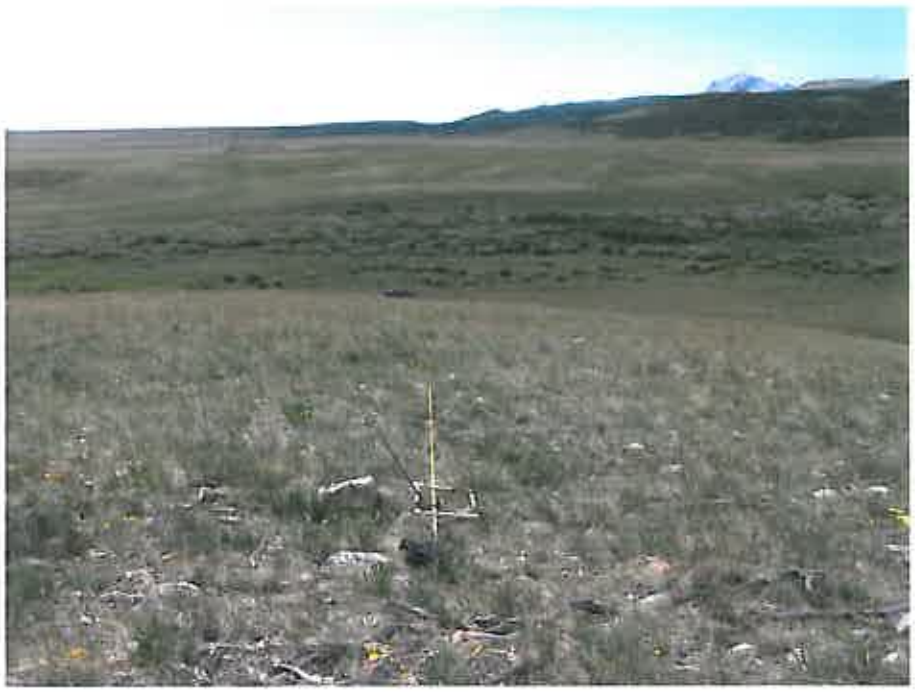
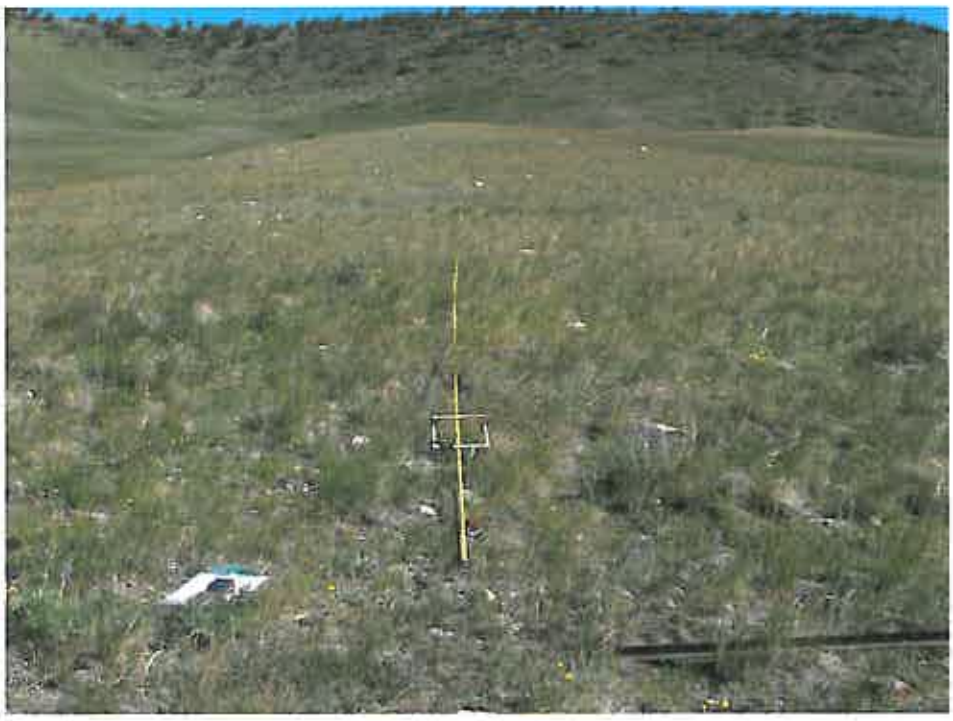
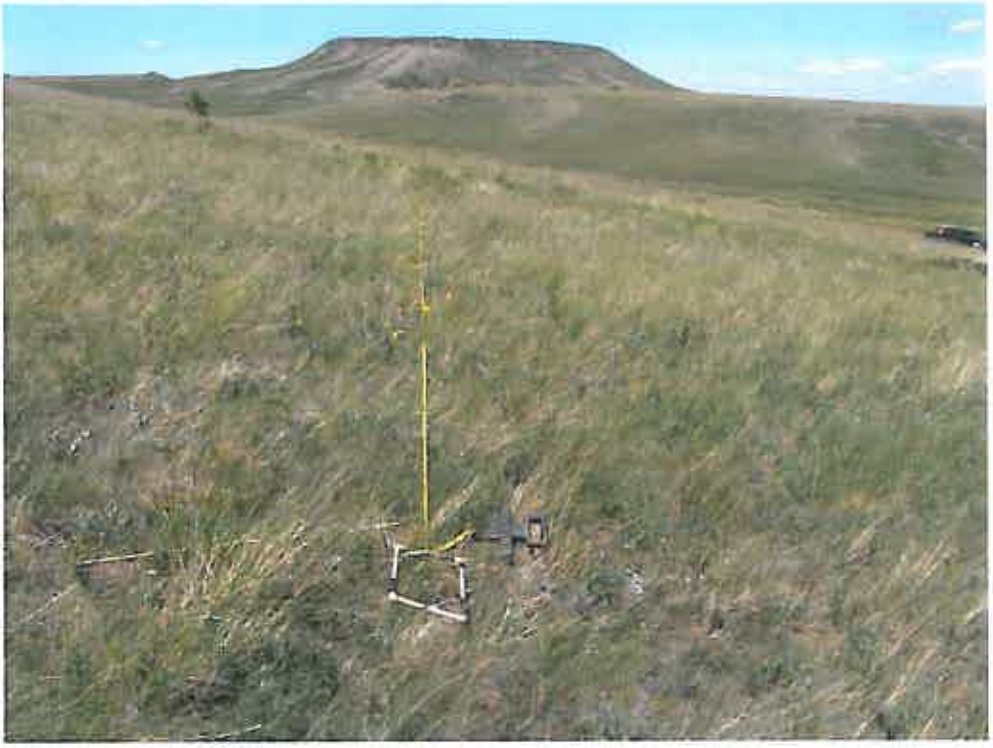




Transect #8

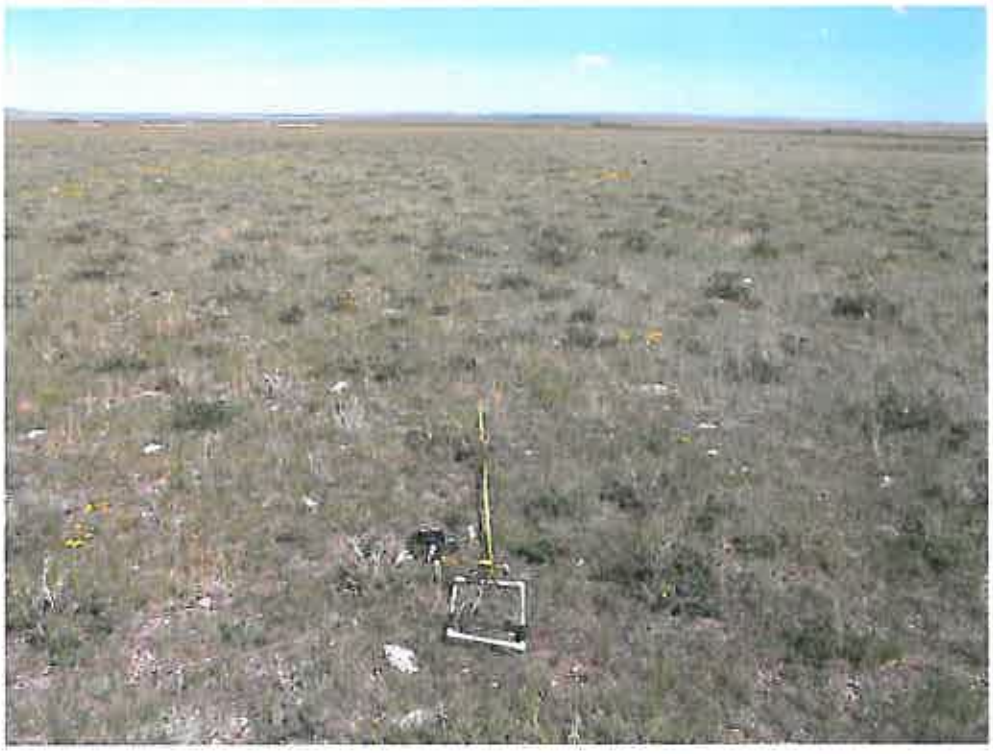
Transect #9

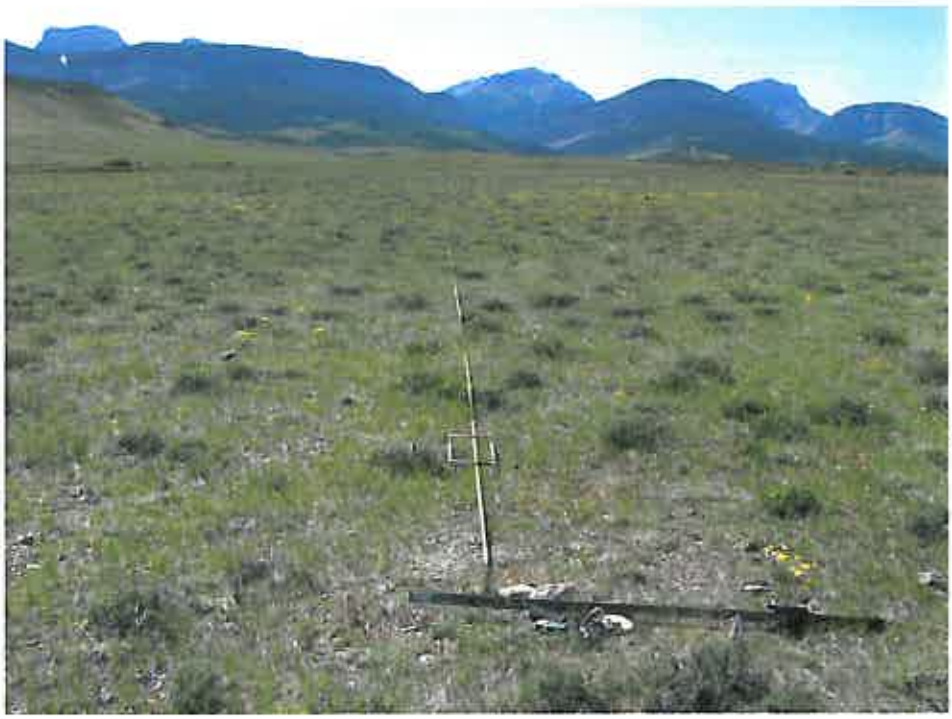


Transect #10

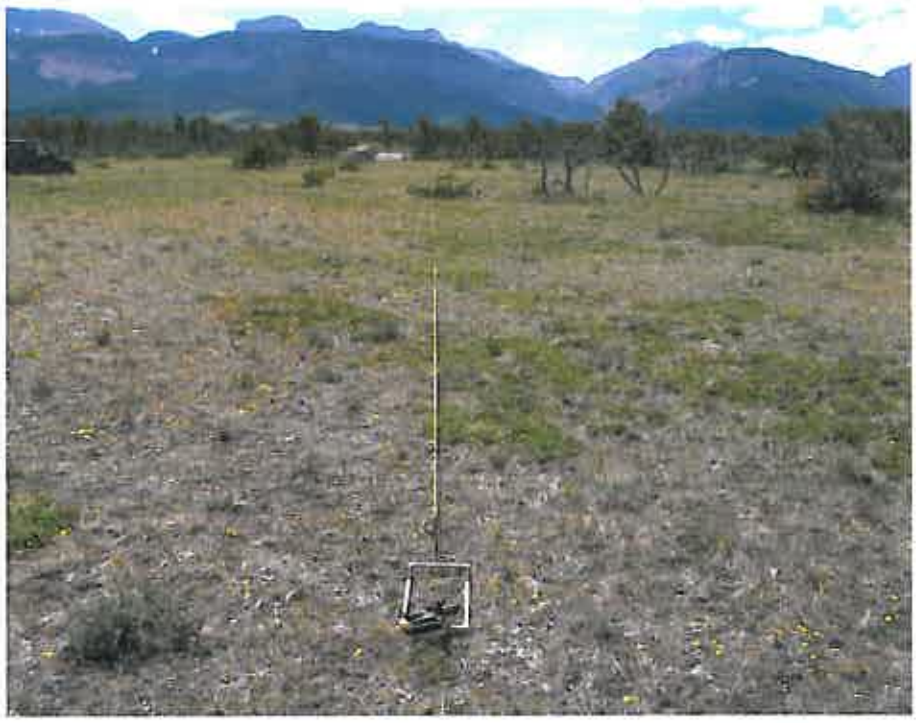
Transect 11

Transect #12



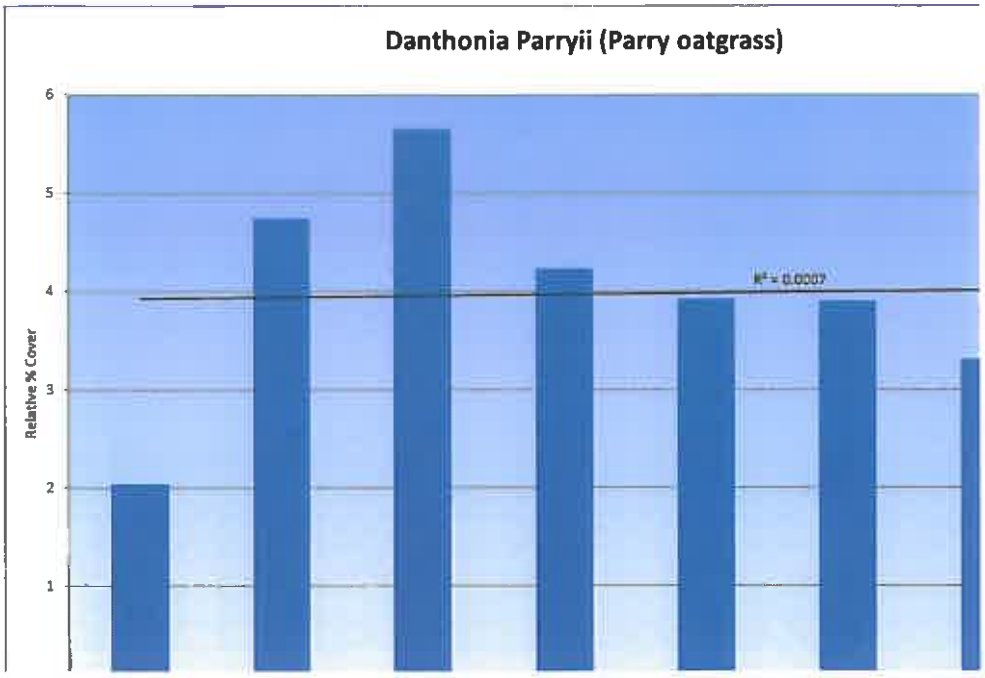


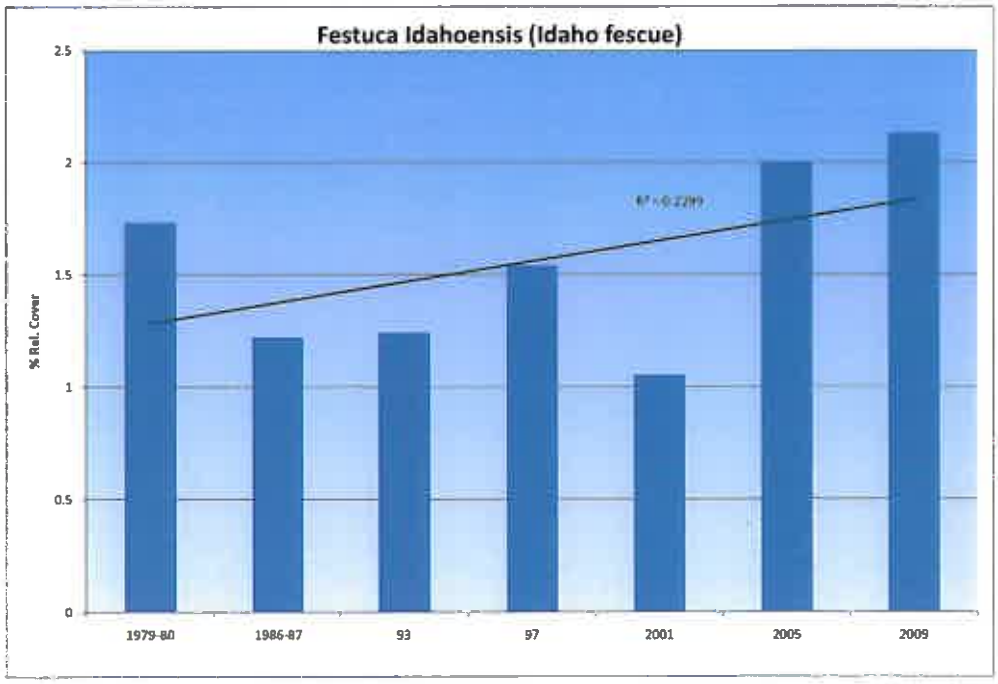
Transect#13

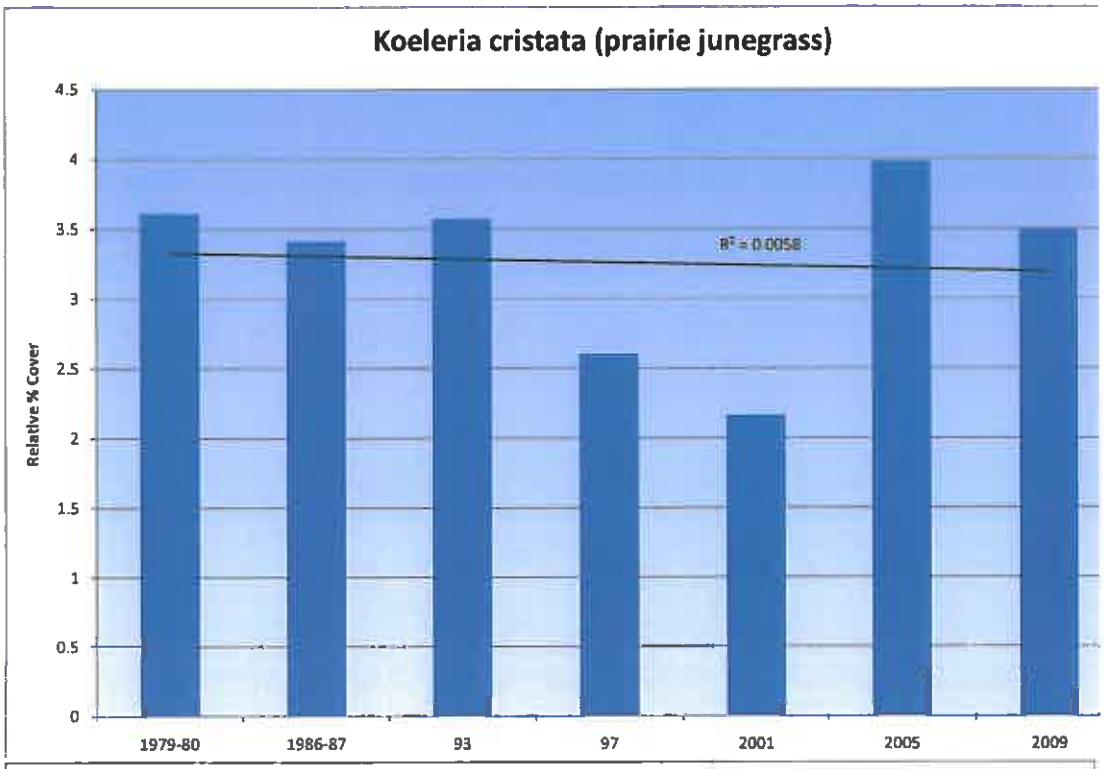


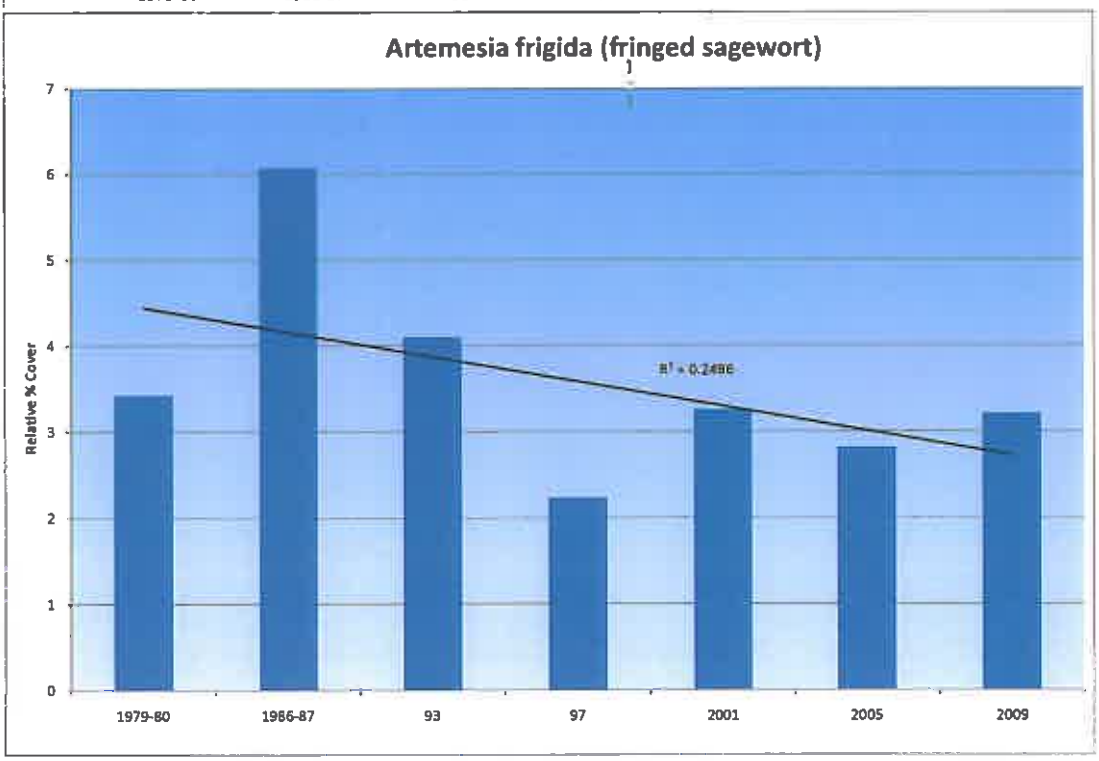
Transect #14

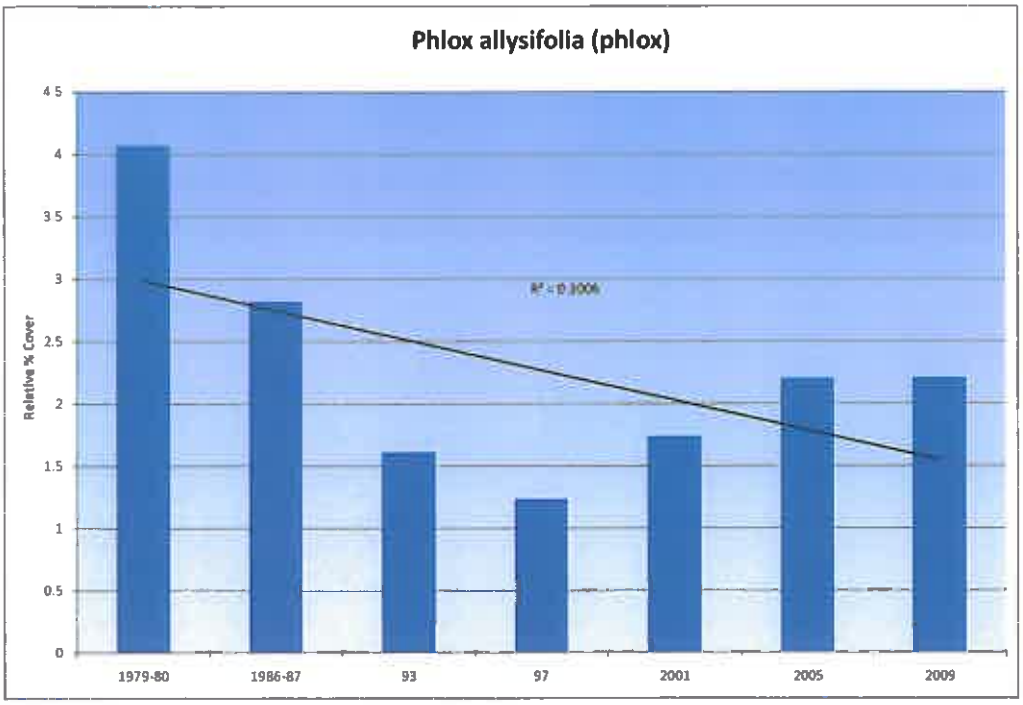
Appendix 3.

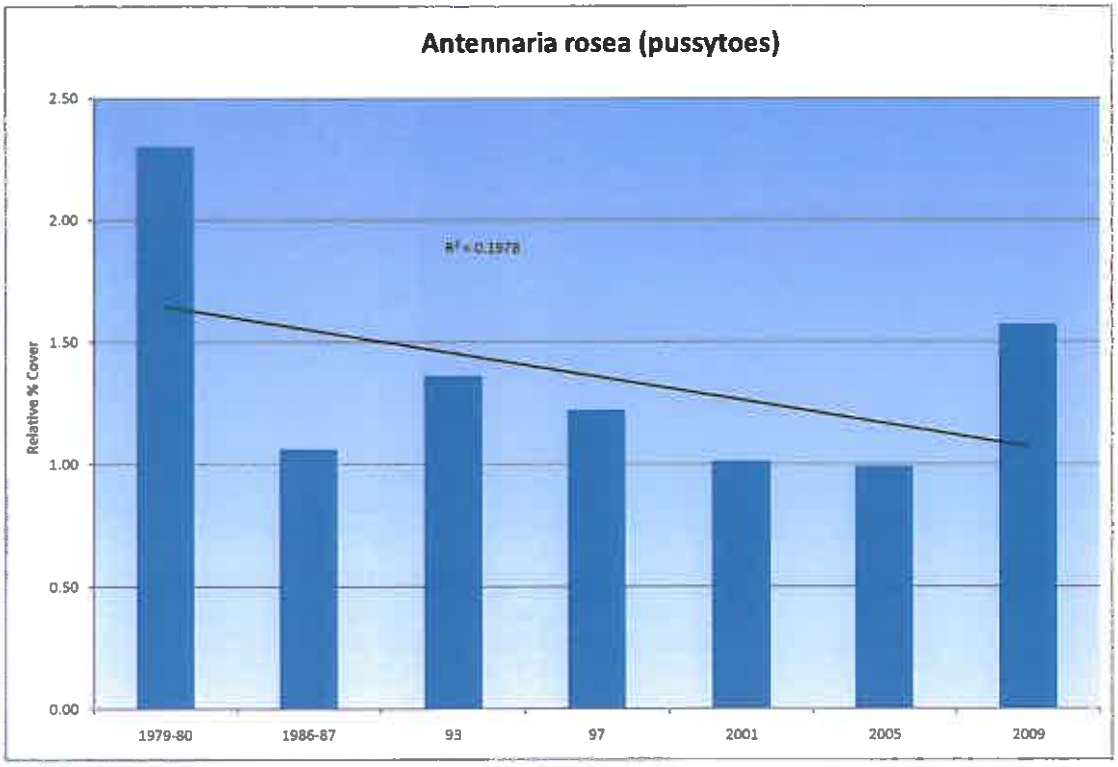

Danthonia Parryii (Parry oatgrass)
Relative % Cover
6
5
4
3
2
1
R² = 0.0007

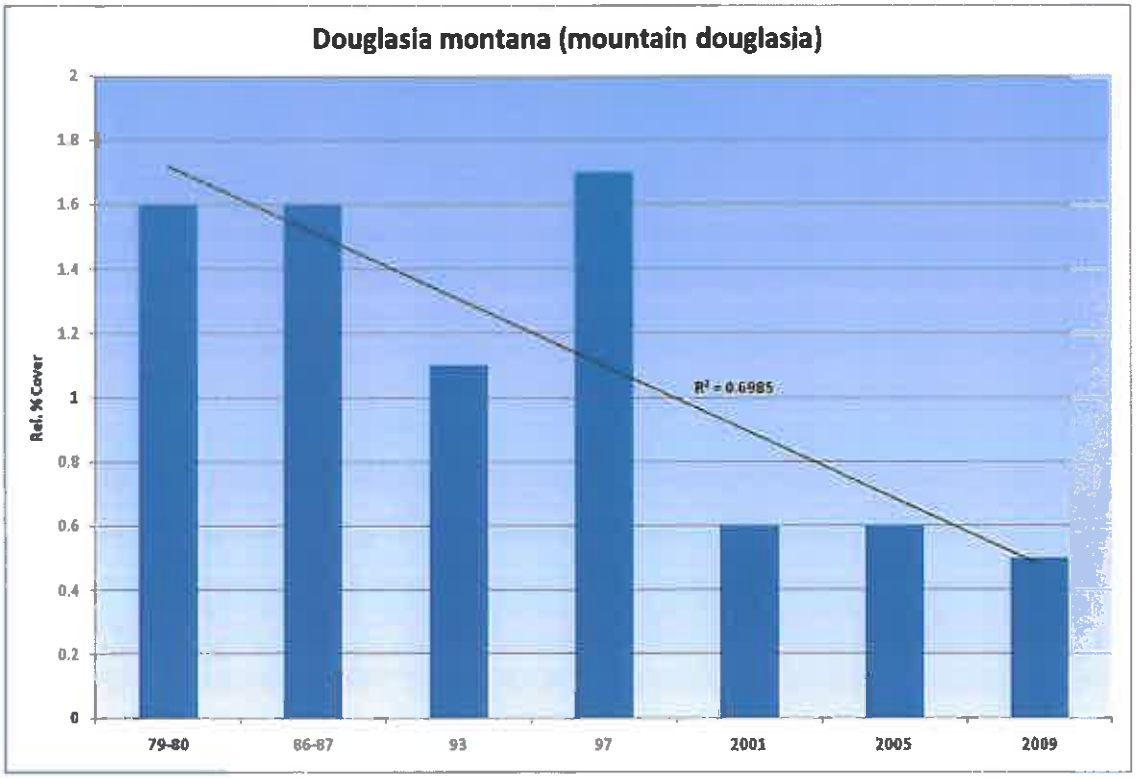

Festuca Idahoensis (Idaho fescue)
% Rel. Cover
2.5
2
1.5
1
0.5
0
1979-80
1986-87
93
97
2001
2005
2009

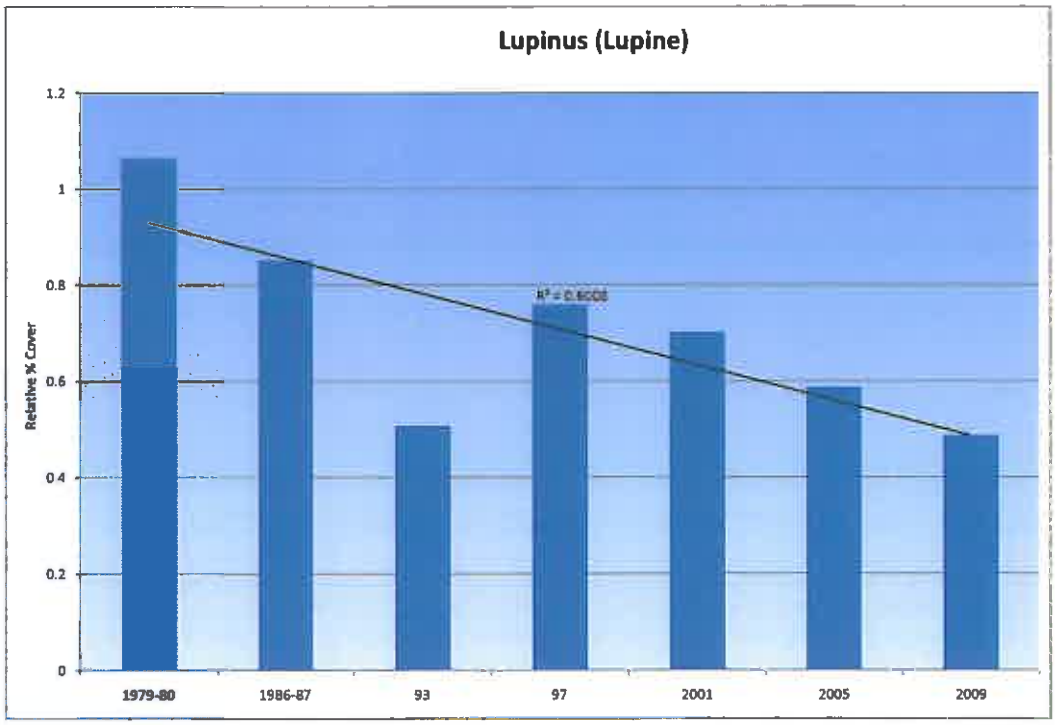

Koeleria cristata (prairie junegrass)
Relative % Cover
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
R^2 = 0.0058
1979-80
1986-87
93
97
2001
2005
2009

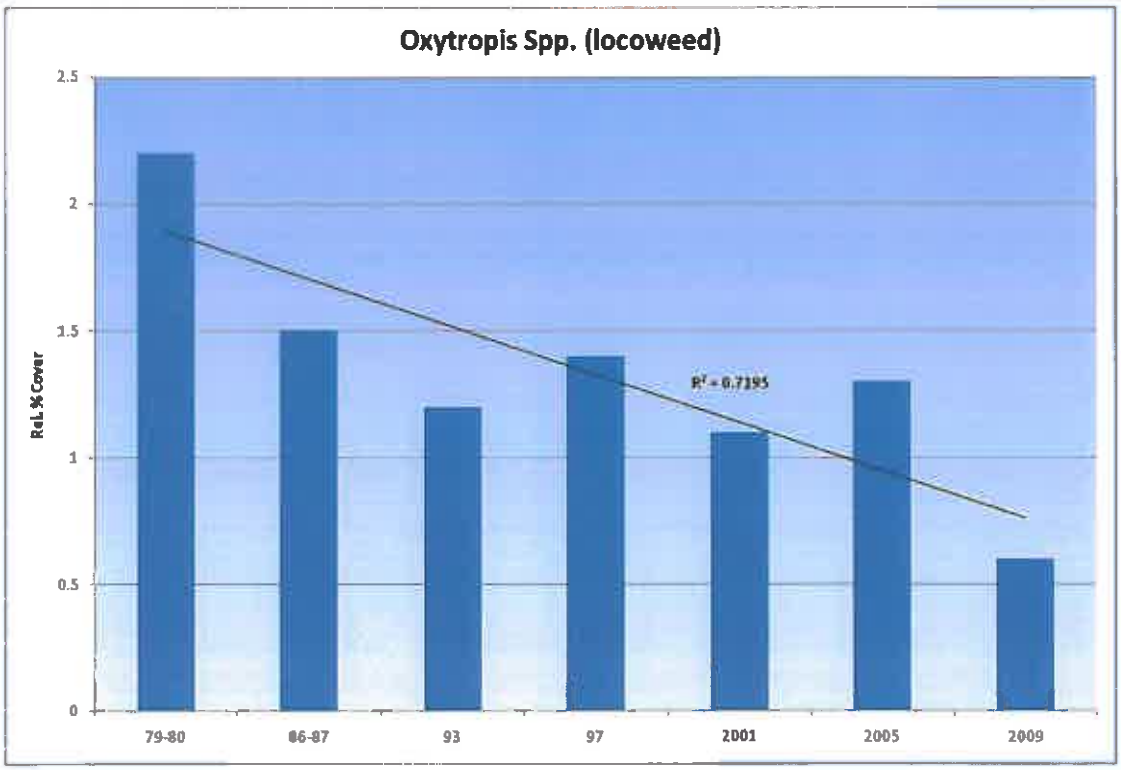

Artemesia frigida (fringed sagewort)
Relative % Cover
7
6
5
4
3
2
1
0
R^2 = 0.2486
1979-80
1986-87
93
97
2001
2005
2009

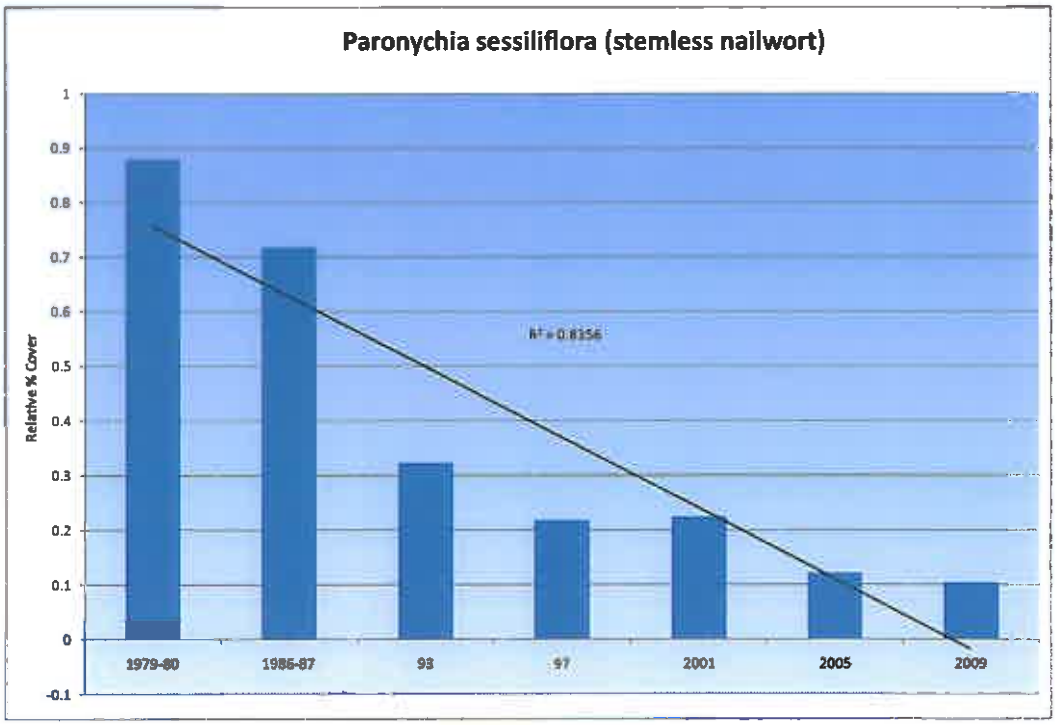

Phlox allysifolia (phlox)
Relative % Cover
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1979-80
1986-87
93
97
2001
2005
2009

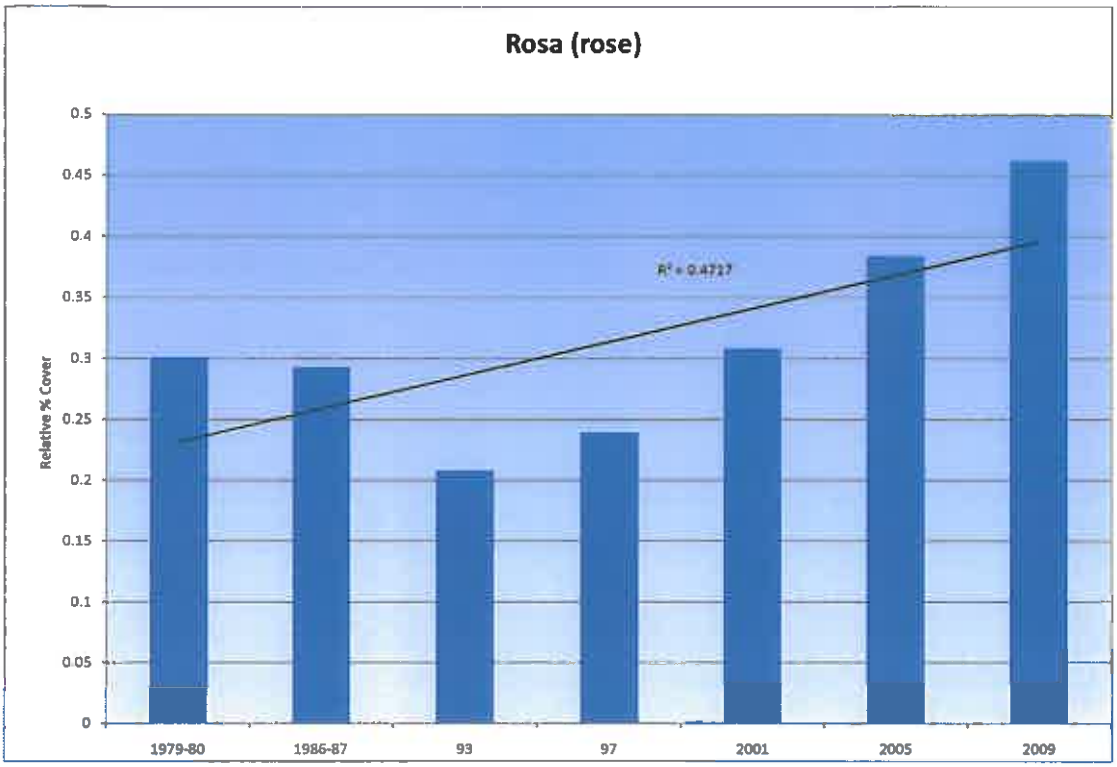

Antennaria rosea (pussytoes)
Relative % Cover
2.50
2.00
1.50
1.00
0.50
0.00
1979-80
1986-87
93
97
2001
2005
2009

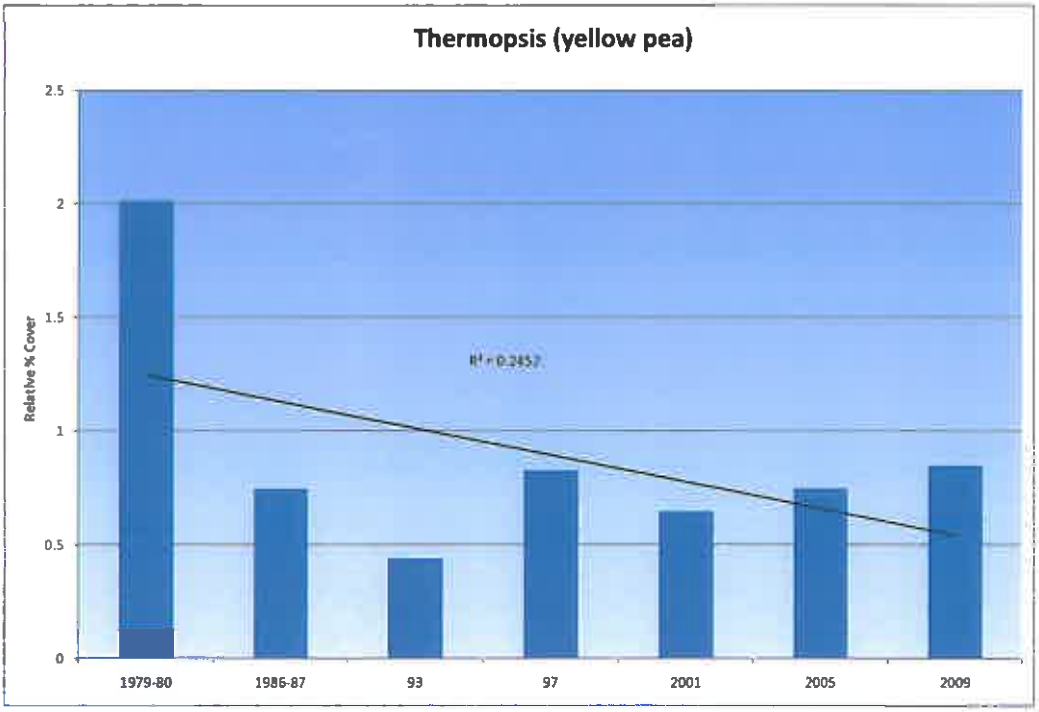

Douglasia montana (mountain douglasia)
Rel. % Cover
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
R² = 0.6985
79-80
86-87
93
97
2001
2005
2009


Lupinus (Lupine)
Relative % Cover
1.2
1
0.8
0.6
0.4
0.2
0
1979-80
1986-87
93
97
2001
2005
2009


Oxytropis Spp. (locoweed)
Rel. % Cover
2.5
2
1.5
1
0.5
0
R² = 0.7195
79-80
86-87
93
97
2001
2005
2009


Paronychia sessiliflora (stemless nailwort)
Relative % Cover
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
R² = 0.8156
1979-80
1986-87
93
97
2001
2005
2009


Rosa (rose)
Relative % Cover
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
R² = 0.4727
1979-80
1986-87
93
97
2001
2005
2009


Thermopsis (yellow pea)
Relative % Cover
2.5
2
1.5
1
0.5
0
R² = 0.2852
1979-80
1986-87
93
97
2001
2005
2009

Appendix 4. Blackleaf WMA Range Transects - Basal Cover Values

Species	Year	T1	T2	T3	T4	T5	T6	T7*	T8*	T9*	T10	T11	T12	T13*	T14*	Total
		%														
All	79-80	24.82	44.30	23.75	30.55	64.13	30.20	44.10	52.90	42.40	41.80	70.00	24.00	42.80	69.50	43.23
	86-87	27.80	44.28	25.15	27.00	55.08	36.30	41.13	51.10	32.83	39.10	53.18	19.58	36.68	37.05	37.59
	93	28.18	44.45	34.25	34.63	55.45	42.85	37.93	54.58	31.93	40.35	56.83	23.93	53.58	68.20	43.37
	97	28.85	53.31	29.63	36.87	60.14	41.91	43.79	56.87	40.58	34.17	61.88	32.73	50.25	72.24	46.09
	2001	25.65	38.04	26.04	27.62	34.59	32.17	33.44	55.96	31.23	39.00	47.78	21.92	40.43	45.35	35.66
	2005	38.18	60.41	46.35	36.33	45.93	49.99	45.50	76.55	44.30	44.45	69.17	36.51	50.29	49.24	49.51
	2009	29.48	43.13	31.65	32.65	40.18	36.82	31.25	68.21	37.38	43.41	52.65	25.20	31.28	41.91	38.94
Grasses	79-80	7.18	8.20	9.95	10.15	11.68	6.23	12.20	11.25	15.40	15.80	8.65	12.00	7.30	4.08	10.01
	86-87	8.21	7.27	14.89	13.58	15.50	8.64	12.79	14.86	18.85	19.96	8.36	9.60	6.68	2.97	11.58
	93	9.50	7.26	22.04	17.69	14.21	11.07	16.09	13.55	23.43	29.30	7.83	10.66	8.19	4.82	13.97
	97	10.73	9.07	16.81	21.65	12.37	10.58	16.66	10.44	31.55	24.20	8.22	11.53	9.48	5.55	14.35
	2001	10.21	8.43	15.91	16.95	12.61	11.30	15.13	11.89	24.76	28.73	7.56	6.26	7.14	5.56	13.03
	2005	16.06	12.60	26.10	18.45	17.40	16.53	22.95	17.90	30.35	33.25	13.98	19.65	12.93	8.43	19.04
	2009	10.00	8.53	18.75	16.35	15.70	12.50	18.15	14.61	23.50	31.00	10.20	11.90	8.40	6.98	14.61
Forbs	79-80	17.64	36.10	13.80	20.40	52.45	23.97	31.90	41.65	27.00	26.00	61.35	12.00	35.50	65.42	33.23
	86-87	19.59	37.01	10.26	13.42	39.58	27.66	28.34	36.24	13.98	19.14	44.82	9.98	30.00	34.08	26.01
	93	18.74	37.03	11.90	16.80	41.32	31.79	21.88	41.06	8.26	11.15	49.00	13.56	45.54	63.09	29.37
	97	18.12	44.24	12.82	17.22	47.77	31.48	25.13	46.43	9.03	9.97	53.64	21.20	40.77	66.69	31.75
	2001	15.44	29.61	10.13	10.67	21.98	20.87	18.31	44.07	6.47	10.27	40.22	15.66	33.29	39.79	22.63
	2005	22.12	47.81	20.25	17.88	28.53	33.46	22.55	58.65	13.95	11.20	55.19	16.86	37.36	40.81	30.47
	2009	19.48	34.60	12.90	16.30	24.28	24.32	13.10	53.60	13.88	12.41	42.45	13.30	24.88	34.93	24.32
Agsp	79-80	0.80	0.50	0.00	0.10	1.50	0.03	1.70	0.80	1.80	1.60	0.80	0.00	0.90	1.10	0.82
	86-87	0.85	0.15	0.05	0.03	0.58	0.00	1.33	0.28	0.40	1.85	0.45	0.00	0.98	1.23	0.58
	93	0.65	0.10	0.05	0.00	0.23	0.00	0.00	0.18	0.08	0.00	0.30	0.00	0.98	1.68	0.30
	97	1.05	0.18	0.00	0.00	0.20	0.00	0.00	0.10	0.05	0.05	0.15	0.00	1.35	1.00	0.30
	2001	0.43	0.00	0.00	0.00	0.18	0.00	0.35	0.25	0.20	0.00	0.00	0.00	1.20	1.00	0.26
	2005	1.10	0.05	0.00	0.00	1.55	0.00	1.50	0.35	0.05	0.05	0.55	0.00	1.50	2.35	0.65
	2009	0.63	0.05	0.00	0.05	0.75	0.00	1.00	0.55	0.50	0.00	0.55	0.00	0.60	1.85	0.47
Agropyron spp	79-80	0.08	1.30	0.00	0.10	0.10	1.20	1.20	0.00	1.50	1.30	1.70	3.60	0.20	0.30	0.90
	86-87	0.08	1.23	0.00	0.00	0.08	1.30	1.55	0.50	1.00	1.10	1.65	5.10	0.03	0.18	0.99
	93	0.08	0.90	0.00	0.00	0.15	0.48	2.50	0.13	0.45	1.00	0.78	4.33	0.08	0.08	0.78
	97	0.13	0.70	0.05	0.15	0.05	1.00	3.23	0.35	3.25	0.45	0.68	3.85	0.20	0.40	1.04
	2001	0.10	0.55	0.00	0.05	0.20	0.40	0.35	0.03	0.53	0.40	0.20	1.30	0.08	0.23	0.32
	2005	0.18	1.35	0.00	0.00	0.15	0.98	1.00	0.20	0.70	1.10	1.20	7.55	0.05	0.15	1.04
	2009	0.05	0.33	0.00	0.10	0.23	0.80	1.90	0.05	1.25	0.90	0.65	4.70	0.10	0.15	0.80
Cafi	79-80	0.30	1.20	0.10	0.05	0.00	0.10	1.50	0.60	0.30	0.60	1.60	0.00	0.00	0.30	0.48
	86-87	0.25	0.00	0.18	0.05	0.15	0.05	0.50	0.10	0.00	0.00	0.00	0.00	0.00	0.05	0.10
	93	0.15	1.30	0.00	0.00	0.10	0.15	1.00	0.35	0.00	0.00	0.00	0.00	0.00	0.05	0.22
	97	0.35	1.50	0.00	0.00	0.10	0.00	2.00	0.20	0.00	0.05	0.25	0.00	0.00	0.35	0.34
	2001	0.65	2.25	0.05	0.10	0.10	0.00	1.35	0.00	0.15	0.00	0.80	0.00	0.00	0.08	0.40
	2005	0.25	4.05	0.05	0.00	0.05	0.00	0.75	0.60	0.00	0.05	0.83	0.00	0.00	0.05	0.48
	2009	0.25	2.10	0.05	0.25	0.00	0.05	0.65	0.25	0.00	0.00	1.50	0.00	0.00	0.05	0.37

		T1	T2	T3	T4	T5	T6	T7*	T8*	T9*	T10	T11	T12	T13*	T14*	Total
Species	Year	%														
Carex spp	79-80	0.00	0.55	0.05	1.45	1.53	0.00	0.35	0.05	0.18	0.70	1.25	0.50	1.60	0.10	0.59
	86-87	0.00	2.87	0.00	1.80	2.23	0.00	0.53	1.75	0.05	0.05	2.57	0.10	2.33	0.10	1.03
	93	0.00	0.28	0.03	0.73	0.90	0.03	0.23	0.95	0.00	0.10	0.85	0.03	1.45	0.08	0.40
	97	0.00	1.08	0.13	0.85	1.45	0.20	0.25	1.08	0.00	0.00	1.33	0.33	2.38	0.40	0.66
	2001	0.00	1.23	0.43	1.10	1.50	0.15	0.00	0.90	0.10	0.28	1.23	0.15	1.65	0.25	0.64
	2005	0.00	1.60	0.00	1.20	2.15	0.00	0.00	0.00	0.00	0.00	2.35	0.00	2.45	0.25	0.71
	2009	0.00	1.20	0.00	1.05	1.30	0.00	0.85	0.25	0.00	0.00	1.30	0.05	1.00	0.30	0.52
Dapa	79-80	0.00	0.00	4.70	1.30	2.40	0.20	0.00	2.30	1.40	0.00	0.00	0.00	0.00	0.00	0.88
	86-87	0.00	0.00	9.75	5.80	4.75	0.03	0.00	4.55	0.05	0.00	0.00	0.00	0.00	0.00	1.78
	93	0.00	0.25	17.50	7.80	3.50	0.10	0.00	5.23	0.00	0.00	0.00	0.00	0.00	0.00	2.45
	97	0.00	0.00	11.25	9.25	4.53	0.05	0.00	2.15	0.00	0.00	0.00	0.00	0.00	0.00	1.95
	2001	0.00	0.00	7.10	7.10	4.15	0.30	0.00	0.98	0.03	0.00	0.00	0.00	0.00	0.00	1.40
	2005	0.00	0.00	12.50	6.35	2.45	2.00	0.00	3.70	0.00	0.00	0.00	0.00	0.05	0.00	1.93
	2009	0.00	0.00	7.00	4.85	3.90	0.25	0.00	2.05	0.00	0.00	0.00	0.00	0.00	0.00	1.29
Feid	79-80	0.00	0.00	1.90	1.70	3.10	0.00	0.30	4.70	5.30	5.50	0.60	0.00	1.10	0.00	1.73
	86-87	0.00	0.00	0.53	0.80	1.30	0.00	0.50	3.85	5.75	3.40	0.40	0.00	0.50	0.00	1.22
	93	0.00	0.00	1.35	2.43	3.15	0.10	0.00	1.15	3.60	3.90	0.50	0.00	1.20	0.00	1.24
	97	0.00	0.05	1.15	4.15	1.73	0.25	0.25	1.83	3.35	7.25	0.35	0.00	1.25	0.00	1.54
	2001	0.00	0.05	0.50	1.95	1.88	0.05	0.35	1.20	2.70	4.55	0.60	0.00	0.90	0.00	1.05
	2005	0.00	0.25	3.00	2.95	2.95	0.10	0.25	2.80	4.55	6.80	2.80	0.00	1.60	0.00	2.00
	2009	0.00	0.25	3.05	4.00	2.70	0.05	0.05	3.00	6.10	8.05	0.95	0.00	1.60	0.00	2.13
Fesc	79-80	1.25	0.90	1.80	1.30	3.00	1.40	2.30	0.90	2.10	3.20	1.20	0.00	1.10	1.70	1.58
	86-87	4.50	2.03	4.13	4.65	5.85	3.30	3.50	2.60	6.10	11.05	3.45	0.00	1.13	0.75	3.79
	93	5.13	2.00	2.50	3.55	8.05	5.40	4.55	4.73	10.30	21.00	4.25	0.00	2.08	1.83	5.24
	97	4.25	3.70	3.63	5.15	4.00	5.60	8.10	5.98	10.80	15.30	4.55	0.00	2.70	2.20	5.43
	2001	5.05	3.20	7.55	6.20	4.45	7.30	10.05	8.20	17.50	23.50	4.10	0.00	2.38	2.55	7.29
	2005	5.65	3.60	10.35	7.70	7.40	10.35	15.35	9.80	18.00	25.00	5.05	0.00	4.35	4.03	9.05
	2009	3.60	2.15	7.65	5.75	5.70	8.20	8.85	7.95	16.50	21.75	3.25	0.00	1.85	3.45	6.90
Kocr	79-80	1.90	3.00	0.60	1.50	0.00	1.80	2.90	0.80	0.80	1.40	0.80	4.60	1.40	0.50	1.56
	86-87	1.25	0.78	0.25	0.45	0.38	2.33	3.10	0.90	1.25	1.80	1.38	2.45	0.98	0.63	1.28
	93	1.33	2.25	0.45	0.60	0.13	3.68	5.10	0.50	0.35	0.40	1.00	3.30	1.45	1.10	1.55
	97	2.30	1.60	0.60	2.00	0.23	2.18	1.70	0.05	0.00	0.00	0.45	3.30	1.20	1.20	1.20
	2001	0.60	1.00	0.28	0.35	0.15	2.70	1.15	0.25	0.05	0.00	0.55	1.48	0.75	1.45	0.77
	2005	4.65	3.15	0.25	0.20	0.60	2.85	2.65	0.30	0.05	0.25	1.15	6.85	2.75	1.85	1.97
	2009	1.25	2.25	0.95	0.55	0.85	2.85	2.80	0.25	0.05	0.05	1.85	3.15	1.10	1.15	1.36
Muhlenbergia spp	79-80	2.35	0.00	0.00	0.05	0.00	1.10	1.80	0.00	0.00	0.60	0.00	2.30	0.80	0.00	0.64
	86-87	1.25	0.00	0.00	0.00	0.00	1.53	1.50	0.00	0.00	0.28	0.00	1.95	0.48	0.00	0.50
	93	2.13	0.00	0.00	0.03	0.00	0.80	2.53	0.00	0.00	0.00	0.00	3.00	0.55	0.00	0.65
	97	2.35	0.00	0.00	0.00	0.00	0.85	2.98	0.00	0.00	0.00	0.00	3.95	0.25	0.00	0.74
	2001	3.23	0.00	0.00	0.00	0.00	0.40	1.43	0.00	0.00	0.00	0.00	3.05	0.18	0.00	0.59
	2005	4.30	0.00	0.00	0.00	0.00	0.25	1.45	0.00	0.00	0.00	0.00	5.00	0.18	0.00	0.80
	2009	3.80	0.00	0.00	0.00	0.00	0.05	1.45	0.00	0.00	0.00	0.00	3.85	0.05	0.00	0.66

		T1	T2	T3	T4	T5	T6	T7*	T8*	T9*	T10	T11	T12	T13*	T14*	Total
Species	Year	%														
Anenome spp	79-80	0.00	0.10	0.50	0.50	0.50	0.03	0.00	1.30	0.00	0.60	1.70	0.00	0.00	0.40	0.40
	86-87	0.00	0.10	0.18	0.28	0.35	0.03	0.00	0.43	0.00	0.13	0.60	0.00	0.00	0.48	0.18
	93	0.00	0.05	0.30	0.18	0.28	0.05	0.00	0.33	0.00	0.13	1.03	0.00	0.03	0.40	0.20
	97	0.00	0.38	0.30	0.13	0.13	0.05	0.00	0.38	0.00	0.30	0.80	0.00	0.00	0.70	0.23
	2001	0.00	0.20	0.38	0.10	0.60	0.10	0.00	0.40	0.00	0.35	0.60	0.00	0.03	0.33	0.22
	2005	0.00	0.30	0.65	0.20	0.45	0.10	0.00	0.85	0.00	0.60	1.15	0.00	0.00	0.50	0.34
	2009	0.00	0.60	0.60	0.45	0.95	0.10	0.00	0.60	0.05	1.10	1.30	0.00	0.05	0.55	0.45
Anro	79-80	0.00	0.00	0.00	0.30	0.50	0.05	0.30	2.30	2.60	4.40	0.30	1.30	1.50	0.50	1.00
	86-87	0.00	0.00	0.05	0.05	0.55	0.00	0.25	0.70	0.50	0.70	0.05	1.00	1.25	0.55	0.40
	93	0.00	0.00	0.55	1.15	0.80	0.25	0.30	0.45	0.75	1.65	0.00	0.75	0.90	0.75	0.59
	97	0.00	0.00	0.18	1.45	0.80	0.25	0.10	0.10	0.60	1.75	0.00	1.00	1.00	0.55	0.56
	2001	0.00	0.00	0.00	0.00	0.00	0.10	0.30	0.00	0.05	1.65	0.00	1.50	0.65	0.75	0.36
	2005	0.00	0.25	0.05	0.00	1.50	0.30	0.30	0.00	1.05	2.05	0.00	0.05	0.00	1.25	0.49
	2009	0.00	0.05	0.00	0.75	1.50	0.05	0.30	0.05	1.75	2.10	0.00	0.05	0.85	1.05	0.61
Arenaria spp	79-80	0.00	0.00	1.00	0.50	1.00	0.50	0.00	0.70	2.60	0.90	0.20	0.00	1.10	0.00	0.61
	86-87	0.00	0.00	0.38	0.65	0.08	0.33	0.00	0.20	0.35	0.30	0.08	0.08	1.23	0.00	0.26
	93	0.00	0.00	0.43	0.73	0.03	0.38	0.00	0.35	0.10	0.23	0.00	0.00	0.65	0.00	0.21
	97	0.00	0.00	0.83	1.65	0.28	0.48	0.00	0.05	0.35	0.38	0.05	0.00	0.35	0.00	0.32
	2001	0.00	0.00	0.48	1.15	0.08	0.23	0.00	0.00	0.03	0.20	0.00	0.00	0.55	0.00	0.19
	2005	0.00	0.00	1.70	0.60	0.20	0.70	0.00	0.00	0.00	0.10	0.00	0.00	0.25	0.00	0.25
	2009	0.00	0.00	2.00	1.45	0.25	0.10	0.00	0.20	0.05	0.35	0.00	0.00	0.25	0.00	0.33
Arfr	79-80	1.50	1.00	0.60	0.60	0.60	1.90	5.40	0.00	3.00	3.70	1.00	1.10	0.30	0.00	1.48
	86-87	2.20	2.38	0.30	0.30	0.40	3.38	7.60	0.00	4.25	5.95	2.40	1.80	0.98	0.00	2.28
	93	5.40	2.40	0.65	0.55	0.33	3.00	3.10	0.00	2.15	3.65	1.68	1.20	0.75	0.00	1.78
	97	4.45	0.68	0.10	0.15	0.10	1.20	2.65	0.00	0.75	0.60	0.40	2.98	0.38	0.00	1.03
	2001	3.90	0.53	0.10	0.05	0.55	1.15	2.73	0.00	0.23	1.20	0.30	5.20	0.30	0.00	1.16
	2005	4.25	1.95	0.00	0.00	0.75	1.10	4.40	0.00	0.30	1.25	0.55	4.65	0.30	0.00	1.39
	2009	6.65	0.85	0.05	0.00	0.75	0.55	1.60	0.00	0.30	1.40	0.15	4.90	0.30	0.00	1.25
Cear	79-80	0.90	0.30	0.50	0.40	0.60	0.10	0.70	0.40	0.40	1.50	0.60	0.50	0.50	0.00	0.53
	86-87	0.88	0.08	0.53	1.23	0.13	0.20	0.15	2.15	1.33	3.35	0.43	0.45	0.23	0.00	0.80
	93	0.80	0.15	0.40	0.48	0.60	0.48	1.23	0.03	0.50	0.08	0.63	2.18	0.58	0.00	0.58
	97	0.95	0.08	0.33	0.75	0.25	0.45	0.58	0.13	0.10	0.00	0.18	2.00	0.48	0.00	0.45
	2001	0.30	0.00	0.33	0.35	0.00	0.53	0.15	0.05	0.00	0.05	0.05	0.03	0.05	0.00	0.14
	2005	1.00	0.15	2.30	2.45	0.05	1.08	0.15	0.95	0.00	0.00	0.50	0.00	0.80	0.13	0.68
	2009	0.25	0.28	0.55	2.40	0.13	0.10	0.05	0.50	0.00	0.40	0.30	0.00	0.55	0.15	0.40
Chv	79-80	0.10	0.00	0.05	0.10	0.00	0.20	0.05	0.30	0.00	0.50	0.30	0.00	0.10	0.00	0.12
	86-87	0.05	0.00	0.03	0.05	0.00	0.68	0.10	0.35	0.00	0.00	0.15	0.00	0.10	0.00	0.11
	93	0.05	0.00	0.23	0.03	0.03	0.45	0.10	0.13	0.00	0.00	0.35	0.00	0.15	0.00	0.11
	97	0.05	0.00	0.55	0.00	0.00	0.25	0.20	0.30	0.00	0.00	0.55	0.00	0.13	0.00	0.15
	2001	0.15	0.00	0.15	0.00	0.00	0.00	0.10	0.08	0.00	0.00	0.10	0.00	0.00	0.00	0.04
	2005	0.10	0.00	0.25	0.00	0.00	0.00	0.30	0.15	0.00	0.00	0.55	0.00	0.00	0.00	0.10
	2009	0.05	0.00	0.15	0.00	0.00	0.00	0.30	0.05	0.00	0.00	0.05	0.00	0.05	0.00	0.05

		T1	T2	T3	T4	T5	T6	T7*	T8*	T9*	T10	T11	T12	T13*	T14*	Total
Species	Year	%														
Coum	79-80	0.20	0.05	0.30	0.80	0.10	0.30	0.40	0.05	0.30	0.80	0.20	0.00	0.00	0.00	0.25
(commandra)	86-87	0.13	0.13	0.13	0.53	0.08	0.28	0.18	0.10	0.05	0.28	0.08	0.00	0.05	0.00	0.14
	93	0.05	0.08	0.15	0.33	0.03	0.35	0.08	0.05	0.10	0.35	0.10	0.00	0.10	0.00	0.13
	97	0.03	0.55	0.33	0.33	0.10	0.23	0.30	0.15	0.00	0.00	0.15	0.00	0.00	0.00	0.16
	2001	0.05	0.28	0.10	0.35	0.15	0.18	0.23	0.00	0.00	0.05	0.08	0.00	0.10	0.00	0.11
	2005	0.25	0.80	0.15	0.80	0.10	0.30	0.30	0.05	0.10	0.00	0.70	0.00	0.08	0.00	0.26
	2009	0.00	0.20	0.55	1.15	0.08	0.25	0.10	0.10	0.25	0.00	0.40	0.00	0.05	0.00	0.22
Domo	79-80	0.00	2.20	0.90	0.40	0.03	2.90	0.00	0.00	0.00	0.00	3.10	0.00	0.10	0.00	0.69
	86-87	0.00	1.28	0.30	0.90	0.28	2.65	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.59
	93	0.00	0.80	0.00	0.18	0.50	2.53	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.49
	97	0.00	2.70	1.05	0.00	0.50	3.60	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.00	0.77
	2001	0.03	0.90	0.30	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.22
	2005	0.00	1.08	0.30	0.30	0.00	1.90	0.25	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.33
	2009	0.00	0.33	0.15	0.10	0.00	1.43	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00	0.18
Erca	79-80	0.60	0.10	0.00	1.75	0.05	1.10	0.60	0.30	0.80	0.80	0.40	0.03	0.30	0.10	0.50
	86-87	0.08	0.53	0.38	0.43	0.05	1.95	0.40	0.25	1.05	1.40	0.28	0.05	0.40	0.05	0.52
(fuzzy)	93	0.85	0.20	0.68	1.00	0.13	2.25	0.28	0.00	0.00	0.88	0.65	0.58	0.25	0.05	0.56
	97	0.88	0.15	0.85	0.25	0.15	1.85	0.15	0.05	0.05	0.25	0.58	1.20	0.50	0.35	0.52
	2001	0.60	0.20	0.00	0.00	0.05	0.55	0.30	0.00	0.00	0.00	0.25	0.50	0.95	0.10	0.25
	2005	0.60	0.15	0.55	0.10	0.50	0.35	0.05	0.00	0.00	0.00	1.15	0.55	1.30	0.25	0.40
	2009	0.25	0.00	0.00	0.20	0.00	0.05	0.00	0.05	0.00	0.90	0.60	0.55	0.45	0.00	0.22
Eroc	79-80	0.40	0.20	0.05	0.20	0.00	0.30	0.20	0.00	0.03	0.03	0.10	0.00	0.10	0.00	0.12
	86-87	0.18	0.50	0.03	0.15	0.00	0.43	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10
(long-leaf)	93	0.08	0.05	0.08	0.15	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.05
	97	0.30	0.25	0.10	0.05	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.15	0.05	0.09
	2001	0.13	0.25	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.15	0.00	0.04
	2005	0.33	0.05	0.00	0.00	0.00	0.50	0.05	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.10
	2009	0.15	0.00	0.00	0.00	0.00	0.15	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.03
Gabo	79-80	0.00	0.10	0.50	0.70	0.20	0.05	0.00	0.75	0.45	0.00	1.40	0.00	0.80	0.05	0.36
	86-87	0.00	0.03	0.68	0.08	0.28	0.08	0.00	0.43	0.00	0.00	0.25	0.00	0.28	0.00	0.15
	93	0.00	0.03	0.38	0.08	0.05	0.10	0.00	0.25	0.05	0.00	0.05	0.00	0.23	0.05	0.09
	97	0.00	0.10	0.48	0.15	0.28	0.33	0.00	0.43	0.05	0.00	0.48	0.00	0.53	0.15	0.21
	2001	0.00	0.00	0.70	0.30	0.05	0.60	0.00	0.23	0.60	0.00	0.28	0.00	0.25	0.05	0.22
	2005	0.00	0.30	1.30	0.60	0.15	0.50	0.00	0.60	0.75	0.00	0.40	0.00	0.23	0.20	0.36
	2009	0.00	0.05	1.00	0.20	0.20	0.00	0.00	0.15	1.05	0.00	0.35	0.00	0.48	0.05	0.36
Hyac	79-80	1.70	0.70	0.50	0.90	0.05	0.30	2.30	0.00	0.00	0.00	0.30	0.00	2.20	0.70	0.69
	86-87	3.00	0.98	0.68	1.25	0.00	0.10	1.53	0.00	0.00	0.00	0.00	0.00	1.75	0.65	0.71
	93	3.40	0.65	0.65	1.03	0.00	0.30	1.15	0.00	0.00	0.00	0.30	0.00	2.25	0.60	0.74
	97	2.25	0.95	0.15	0.65	0.00	0.10	1.30	0.00	0.00	0.00	0.15	0.00	1.50	0.40	0.53
	2001	3.15	1.08	0.10	0.60	0.05	0.20	0.50	0.00	0.00	0.00	0.03	0.00	1.18	0.65	0.54
	2005	4.18	1.65	0.30	0.80	0.00	0.20	0.25	0.00	0.00	0.00	0.00	0.00	1.65	0.55	0.68
	2009	3.35	0.88	0.10	0.60	0.00	0.25	0.45	0.00	0.00	0.00	0.05	0.00	1.45	0.30	0.53

		T1	T2	T3	T4	T5	T6	T7*	T8*	T9*	T10	T11	T12	T13*	T14*	Total
Species	Year	%														
Juho	79-80	0.00	15.10	0.00	0.00	27.80	2.00	2.50	6.30	0.00	0.00	29.50	0.00	0.50	0.00	5.98
	86-87	0.00	18.80	0.00	0.00	24.35	4.55	1.75	15.50	0.00	0.00	27.25	0.00	0.05	0.25	6.61
	93	0.00	23.00	0.00	0.75	35.30	10.75	6.75	23.50	0.00	0.00	30.55	0.00	0.30	0.30	9.37
	97	0.00	26.05	0.00	2.50	41.00	12.55	7.75	30.35	0.00	0.00	36.50	0.00	1.10	1.00	11.34
	2001	0.00	21.50	0.00	2.00	16.50	7.05	6.00	34.00	0.00	0.00	32.75	0.00	1.80	2.00	8.97
	2005	0.00	28.30	0.00	2.75	20.80	12.05	5.50	43.25	0.00	0.00	37.75	0.00	1.00	1.05	10.89
	2009	0.00	24.55	0.05	1.50	18.05	12.60	1.60	43.00	0.00	0.00	29.95	0.00	0.25	1.25	9.49
Lipu	79-80	0.20	0.00	0.40	0.60	0.00	0.05	0.30	0.00	0.00	0.80	0.05	0.00	0.10	0.00	0.18
	86-87	0.33	0.00	0.50	0.38	0.00	0.33	0.63	0.00	0.00	1.28	0.00	0.00	0.30	0.00	0.27
	93	0.48	0.00	0.45	0.50	0.00	0.35	0.25	0.00	0.00	0.78	0.10	0.00	0.15	0.00	0.22
	97	0.55	0.00	0.68	0.35	0.00	0.28	0.88	0.00	0.00	0.75	0.05	0.00	0.30	0.00	0.27
	2001	0.95	0.00	0.98	0.90	0.00	0.40	1.10	0.00	0.00	1.15	0.05	0.00	0.40	0.00	0.42
	2005	0.45	0.00	1.90	0.90	0.00	0.65	0.90	0.00	0.00	1.00	0.00	0.00	0.35	0.00	0.44
	2009	0.50	0.00	0.75	0.40	0.00	0.45	0.95	0.00	0.00	0.40	0.05	0.00	0.05	0.00	0.25
Lupinus spp	79-80	0.00	1.10	0.60	0.30	0.90	1.60	0.05	0.90	0.05	0.70	0.20	0.00	0.00	0.00	0.46
	86-87	0.00	0.05	0.15	0.18	1.10	1.10	0.85	0.13	0.00	0.83	0.05	0.00	0.00	0.00	0.32
	93	0.00	0.15	0.58	0.10	0.55	0.40	0.10	0.10	0.15	0.53	0.40	0.00	0.00	0.00	0.22
	97	0.00	0.98	0.18	0.00	0.33	0.68	0.30	0.23	0.25	1.35	0.60	0.00	0.00	0.00	0.35
	2001	0.00	0.13	0.20	0.18	0.45	0.50	0.15	0.40	0.05	1.03	0.35	0.00	0.00	0.00	0.25
	2005	0.00	0.40	0.35	0.30	0.40	1.10	0.00	0.05	0.35	0.60	0.45	0.00	0.00	0.00	0.29
	2009	0.00	0.05	0.65	0.10	0.15	0.35	0.25	0.35	0.05	0.38	0.30	0.00	0.00	0.00	0.19
Oxytropis spp	79-80	0.25	2.75	0.20	1.10	0.30	1.30	3.40	0.90	0.00	0.05	1.80	0.20	0.85	0.20	0.95
	86-87	1.00	0.55	0.00	0.05	0.10	0.05	3.18	0.25	0.00	1.50	0.00	0.00	0.55	0.70	0.57
	93	0.78	0.96	0.05	0.45	1.06	0.35	1.50	0.10	0.10	0.65	0.10	0.00	0.58	0.90	0.54
	97	0.55	1.73	0.10	0.33	1.30	0.65	2.46	0.00	0.05	1.00	0.63	0.00	0.00	0.00	0.63
	2001	0.30	0.55	0.05	0.05	1.03	0.40	0.75	0.05	0.25	1.18	0.15	0.05	0.10	0.35	0.38
	2005	1.10	2.05	0.10	0.35	1.20	0.60	1.30	0.30	0.00	1.10	0.15	0.25	0.25	0.05	0.63
	2009	0.10	0.48	0.50	0.05	0.15	0.05	0.00	0.00	0.00	1.10	0.00	0.00	0.00	0.65	0.22
Phal	79-80	1.30	1.20	0.20	0.80	0.05	7.60	2.50	0.30	0.50	1.90	5.20	0.00	0.80	2.30	1.76
	86-87	0.95	0.95	0.05	0.35	0.00	5.80	1.80	0.00	0.05	0.58	2.55	0.00	0.53	1.28	1.06
	93	1.08	1.15	0.00	0.23	0.00	3.50	1.90	0.05	0.00	0.00	0.88	0.00	0.23	0.83	0.70
	97	2.25	0.95	0.15	0.65	0.00	0.10???	1.30	0.00	0.00	0.00	0.15	0.00	1.50	0.40	0.57
	2001	2.08	0.63	0.00	0.15	0.05	3.65	0.90	0.00	0.00	0.00	0.18	0.00	0.15	0.65	0.62
	2005	3.55	0.70	0.00	0.35	0.05	6.10	2.00	0.00	0.00	0.00	1.35	0.00	0.10	1.05	1.09
	2009	3.25	0.75	0.00	0.50	0.05	3.60	1.15	0.00	0.00	0.00	1.55	0.00	0.15	0.90	0.86
Phho	79-80	4.00	7.70	3.40	7.80	0.10	0.30	6.60	3.00	2.90	1.70	6.10	0.00	1.40	0.00	3.21
	86-87	5.55	6.88	3.25	5.55	0.40	0.50	4.25	1.30	0.85	1.80	1.55	0.00	1.05	0.00	2.35
	93	2.88	4.95	2.90	6.45	0.18	0.50	3.00	1.65	0.00	0.10	0.75	0.00	0.68	0.05	1.72
	97	3.15	5.23	3.43	5.70	0.15	0.05	3.45	0.30	0.00	0.00	0.58	0.00	0.28	0.00	1.59
	2001	2.20	1.90	3.45	3.15	0.00	0.05	2.10	0.53	0.00	0.00	0.18	0.00	0.10	0.00	0.98
	2005	3.80	3.45	4.10	3.65	0.05	0.50	3.60	0.30	0.00	0.00	0.25	0.00	0.75	0.05	1.46
	2009	3.70	4.05	2.20	3.35	0.08	0.25	2.95	0.00	0.00	0.00	0.65	0.00	0.40	0.05	1.26

		T1	T2	T3	T4	T5	T6	T7*	T8*	T9*	T10	T11	T12	T13*	T14*	Total
Species	Year	%														
Pofr	79-80	0.00	0.00	0.60	0.00	0.00	0.50	1.00	15.30	0.00	0.80	4.00	6.10	5.30	0.50	2.44
	86-87	0.00	0.00	0.55	0.00	0.00	0.90	2.00	10.00	0.00	0.10	2.85	4.15	5.25	1.00	1.91
	93	0.00	0.03	1.05	0.00	0.00	1.65	0.05	10.40	0.00	0.50	4.15	6.33	3.55	0.75	2.03
	97	0.00	0.03	0.60	0.00	0.00	1.10	0.75	6.65	0.00	0.50	3.20	8.35	3.55	0.50	1.80
	2001	0.00	0.05	0.55	0.00	0.00	0.90	0.50	5.95	0.05	0.30	2.30	5.25	3.35	1.00	1.44
	2005	0.00	0.00	2.00	0.00	0.00	1.85	1.50	8.45	0.25	1.00	5.30	8.80	5.00	1.25	2.53
	2009	0.00	0.00	0.50	0.00	0.00	1.55	1.00	4.40	0.05	1.25	1.90	5.15	1.80	0.80	1.31
Potentilla	79-80	0.50	0.05	0.20	0.05	0.00	0.30	0.10	0.00	0.40	0.05	0.10	0.70	0.00	0.00	0.18
spp.	86-87	0.00	0.00	0.05	0.00	0.00	0.30	0.50	0.00	0.00	0.10	0.05	0.45	0.00	0.00	0.10
	93	0.05	0.03	0.08	0.03	0.00	0.05	0.23	0.00	0.05	0.10	0.00	0.45	0.00	0.00	0.08
	97	0.00	0.40	0.10	0.25	0.00	0.60	0.55	6.65???	0.10	0.25	3.33???	1.80	0.00	0.00	0.34
	2001	0.00	0.00	0.10	0.00	0.00	0.25	0.15	0.00	0.05	0.65	0.00	1.45	0.00	0.00	0.19
	2005	0.00	0.00	0.35	0.00	0.00	0.35	0.75	0.00	0.05	0.10	0.15	0.45	0.00	0.00	0.16
	2009	0.00	0.00	0.15	0.00	0.00	0.15	0.55	0.00	0.05	0.05	0.10	0.20	0.00	0.00	0.09
Rosa	79-80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.40	1.00	0.00	0.00	0.00	0.30	0.13
	86-87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.65	0.25	0.00	0.05	0.00	0.35	0.11
	93	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.15	0.28	0.60	0.05	0.05	0.00	0.10	0.09
	97	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.15	0.70	0.45	0.05	0.05	0.00	0.15	0.11
	2001	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.15	0.40	0.80	0.05	0.05	0.00	0.08	0.11
	2005	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.40	1.10	0.90	0.05	0.00	0.00	0.10	0.19
	2009	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.20	1.00	1.15	0.05	0.00	0.00	0.10	0.18
Seca	79-80	0.50	0.10	0.10	0.30	0.03	0.50	0.30	0.00	0.00	0.00	0.05	0.10	1.30	0.20	0.25
	86-87	1.60	0.30	0.15	0.15	0.00	1.45	0.23	0.00	0.00	0.00	0.25	0.15	0.80	0.40	0.39
	93	0.40	0.45	0.23	0.65	0.03	0.70	0.10	0.00	0.00	0.00	0.05	0.05	0.65	0.50	0.27
	97	0.35	1.00	0.15	0.05	0.00	0.40	0.10	0.00	0.00	0.00	0.05	0.25	0.40	0.70	0.25
	2001	0.10	0.23	0.18	0.05	0.30	0.35	0.00	0.00	0.50	0.00	0.00	0.20	0.33	0.60	0.20
	2005	0.25	1.30	0.30	0.25	0.25	0.30	0.00	0.00	0.00	0.00	0.00	0.05	1.05	1.08	0.35
	2009	0.15	0.50	0.15	0.40	0.05	0.20	0.00	0.00	0.00	0.00	0.05	0.00	0.10	0.75	0.17
Thrh	79-80	0.00	0.00	0.30	0.60	0.70	0.20	0.00	0.00	9.80	0.00	0.60	0.00	0.00	0.00	0.87
	86-87	0.00	0.00	0.05	0.25	0.78	0.15	0.00	0.08	1.95	0.00	0.70	0.00	0.00	0.00	0.28
	93	0.00	0.00	0.20	0.40	0.28	0.18	0.00	0.13	0.80	0.05	0.60	0.00	0.00	0.00	0.19
	97	0.00	0.00	0.40	0.40	0.90	0.40	0.00	0.05	2.40	0.00	0.78	0.00	0.00	0.00	0.38
	2001	0.00	0.00	0.50	0.48	0.48	0.35	0.00	0.15	0.50	0.00	0.80	0.00	0.00	0.00	0.23
	2005	0.00	0.00	0.90	1.05	0.58	0.85	0.00	0.00	0.95	0.00	0.83	0.00	0.00	0.00	0.37
	2009	0.00	0.00	0.35	0.60	0.40	0.60	0.00	0.10	1.90	0.00	0.60	0.00	0.00	0.05	0.33

* indicates ungrazed transect